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A metrical study of leaf-shape in hybrids: II

SOME HYBRID OAKS AND THEIR BEARING ON TURING'S THEORY OF MORPHOGENESIS

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INTRODUCTION

When considering the choice of subjects for investigation in the first paper of this series, my attention was drawn to a curious phenomenon manifested by the leaves of certain hybrid oaks, of which *Quercus cerris* L., the Turkey Oak and *Q. suber* L., the Cork Oak, are the parents. The original hybrid was raised by the nurseryman Lucombe, at Exeter, about the year 1762, from seeds of *Q. cerris*. An account of it was published by J. C. Loudon in his 'Arboretum et Fruticetum Britannicum' (London 1838) under the name *Q.* × *lucombeana*. The tree is fertile, but it is propagated vegetatively by grafting to maintain the characters of the original nothomorph. Seedlings raised from it segregate for leaf, stem and bark characters. Among them is the form known as '*Q.* × *lucombeana* var. *diversifolia*' on account of the variability in shape of the leaves. Many of its leaves have sinuate-dentate margins, more or less intermediate between those of the original parents. Interspersed with such leaves are others, in which portions of the lamina towards the middle of the leaf seem to be missing and, most extraordinary of all, some in which the whole of the central portion of the lamina is suppressed. Leaves in the latter class have a rounded apical lobe connected with a small rounded to triangular basal lobe by a length of bare midrib, the overall length of the leaf remaining substantially unaltered.

MATERIAL AND TECHNIQUE.

An examination of the leaves of the two parent oak species and their F_1 hybrid was first made on the lines followed in earlier work (Melville, 1960). This provided a background to the more unusual problem of the segregate. The leaves were collected from well grown short shoots from the crowns of the trees. In these oaks, there is a tendency for the leaves to be aggregated immediately below the terminal bud, so that it was not always possible to be certain of the exact position of a leaf in the developmental sequence. With the object of sampling leaves belonging to one physiological phase, the third leaf

from the apex was chosen, but probably adjacent leaves were sometimes taken. On *Q.* × *lucombeana* var. *diversifolia*, the third leaf was generally irregular, with median portions of the lamina suppressed to varying extents. Usually, the terminal leaves showed the most extreme degree of suppression of the lamina and a collection of them was made for measurement. All of the trees sampled were growing in the Royal Botanic Gardens, Kew, the *Q. cerris* being the large tree on the Grand Walk, the *Q. suber* on the Seven Sisters' Lawn and the *Q.* × *lucombeana* from the large old grafted tree east of the Lake, which is almost certainly an early sibling of the original clone. The *Q.* × *lucombeana* var. *diversifolia* was a tree on the outskirts of the oak collection near the river.

In earlier work on hybrids (Melville, 1960), the leaf-outlines studied were obtained by joining the tips of the lobes or teeth of serrate or dentate leaves. A similar procedure was followed in the present study, using the means of ten leaves. It was necessary, in addition, to obtain rectangular coordinates for the tips of the lobes, the points of inflexion at the bases of the sinuses and the positions of origin of the lateral nerves on the midrib. The number of lateral nerves on each side of the midrib fluctuates about seven in both species, so that exact comparisons were possible by the choice of leaves in which at least one side had seven nerves. Measurements were made of one side only, as it was not practicable to find, in a reasonable time, a sufficient number of leaves with both sides similar. For the var. *diversifolia*, measurements were taken at the points of inflexion on the basal and apical lobes and at ten-percent levels along the midrib.

The F_1 Hybrid

The mean values obtained from the observations were used for the comparison of the primary leaf-shapes, produced by joining the tips of the serratures (Fig. 1, full lines) and the secondary leaf-shapes, resulting from a linking up of the points of inflexion at the bases of the sinuses (Fig. 1, dotted lines). The shapes and positions of the teeth, with the lengths of their primary nerves and the angles contained between these nerves and the midrib were also studied. On account of the large size of the sinuses, the untrained eye tends to overlook the primary leaf-shape of *Q. cerris* and to be impressed by the secondary shape, which outlines the solid body of the leaf. An observer's subjective impressions of the degree to which a hybrid leaf is intermediate between its parents is influenced by this phenomenon. The size of the hybrid leaves makes them appear close to *Q. cerris*, but the serrature seems closer to *Q. suber* than precise measurements show it to be.

The primary leaf-shape of *Q. cerris* (Fig. 1A) is elliptic acute, with the point of maximum breadth at the mid point, although the leaf is of nearly uniform breadth from the 35 to the 65 per cent levels above the base. In *Q. suber*, the primary shape is ovate acute, with maximum breadth at the 35 per cent level, above which it tapers in a gentle curve to the apex. The F_1 hybrid is elliptic acute, but with the point of maximum breadth at the 45 per cent level and an almost uniform breadth from the 35 to the 55 per cent level. In its general shape and in the position of maximum breadth, therefore, the hybrid shows slight bias towards *Q. cerris*. If transparencies of the leaf outlines of *Q. cerris* and *Q.* × *lucombeana* are superimposed, it can be seen that the maximum breadth difference, equivalent to 3 per cent of the lamina length,

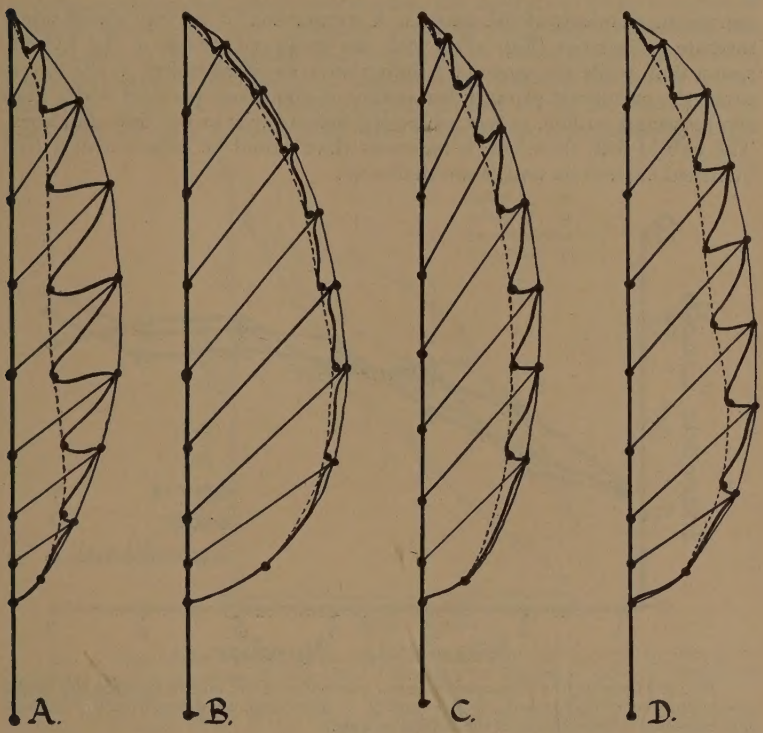

FIG. 1. Mean shapes of half leaves of A, *Quercus cerris*; B, *Q. suber*; C, *Q.* × *lucombeana*; D, theoretical intermediate between A and B. The natural leaf-outline is shown by a thick line, the primary leaf-shape by a thin unbroken line and the secondary leaf-shape by a dotted line.

occurs at the 25 per cent level above the base. Above that point, the difference declines until, at the 70 per cent level and above, the outlines are coincident. *Q. suber* is wider than the hybrid throughout its length. It is evident that neither parent is consistently dominant along the leaf-axis. A change in the relative dominance of the parents takes place, with *Q. suber* exerting its maximum influence near the leaf-base and *Q. cerris* becoming dominant towards the apex, the effects of the two parents intergrading, as in the *Prunus*, *Rhododendron* and *Ribes* hybrids studied earlier (Melville, 1960).

The secondary leaf-outlines are more divergent in appearance than the primary shapes (Fig. 1 A, B, C), for the sinuses are shallow towards the base in *Q. cerris* and deep thereafter until the tip is reached, whereas in *Q. suber* all the sinuses are shallow and are gently graded in size. In regard to the uniformity of the sinus-depth, the hybrid is near to *Q. suber*. The measured sinus-depth is almost exactly intermediate from the 35 per cent level upwards, but the lowest sinus is deeper than required in a theoretical intermediate. This suggests that the sinus-pattern of *Q. suber* is dominant and is inherited in a unitary manner. Nor does the modulation of this pattern, in so far as it controls the depths of the sinuses, appear to operate in a piecemeal fashion, but rather to be governed by a generalised interaction between the growth

control mechanisms of the parents. A comparison of the calculated intermediate leaf-shapes (Fig. 1D), with the measured means of the hybrid, shows that, while the secondary shapes are coincident except at the lowest sinus, the calculated primary leaf-outline is about two per cent wider than the measured outline, except where the leaves taper at the base and apex. The hybrid leaf, therefore, is narrower than would be expected in a true intermediate and its sinuses are shallower.

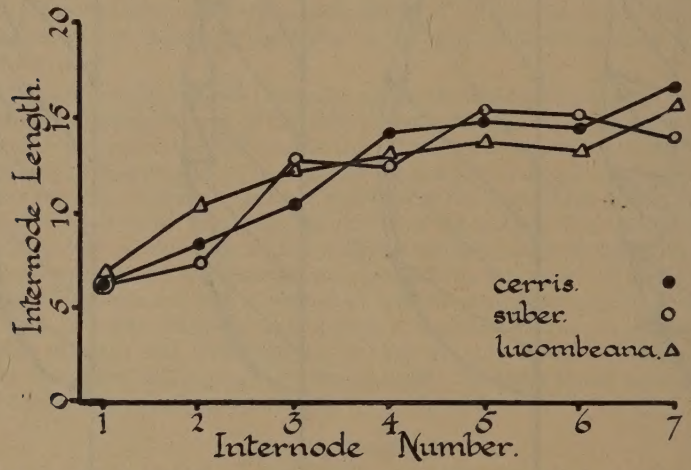

FIG. 2. Mean lengths of successive neural internodes of the midrib between the lateral nerves in leaves of *Quercus cerris*, *Q. suber* and *Q.* × *lucombeana*, numbered from the leaf base and expressed as percentages of the lamina-lengths.

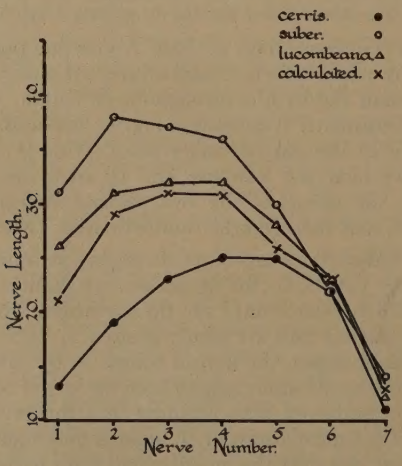

FIG. 3. Mean lengths of the lateral nerves in leaves of *Quercus cerris*, *Q. suber*, *Q.* × *ucombeana* and the calculated intermediate, expressed as percentages of the lamina-lengths. The nerves are numbered consecutively from the leaf-base.

Without taking the analysis any further, this appears to be an example of negative heterosis on the characters of leaf-breadth and sinus-depth. An examination of the orientation and lengths of the lateral nerves throws some additional light on the condition. The points of origin of the lateral nerves along the midrib in both parents and the hybrid follow the same pattern and there are no significant differences between the corresponding neural

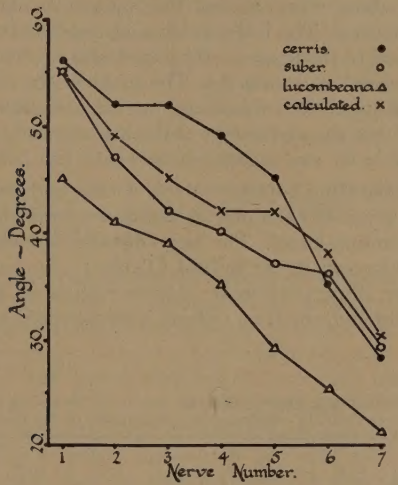

FIG. 4. Mean angles between lateral nerves and midrib in *Quercus cerris*, *Q. suber*, *Q.* × *lucombeana* and the calculated intermediate. The angles for successive nerves are numbered from the leaf-base.

internode-lengths in all three. (Fig. 2). The lengths of the lateral nerves are, proportionally, much greater in *Q. suber* than in *Q. cerris*, over the greater part of the leaf. Although the two uppermost are nearly equal, the lower nerves differ considerably, the maximum difference occurring in the second (Fig. 3). The angles contained between the lateral nerves and the midrib are greatest for the lowest nerves, but become more acute for each successive nerve towards the leaf-apex. The succession of angles conforms with the same general pattern in both parents and the hybrids, but the angles in the hybrid are uniformly more acute than would be anticipated from an examination of the parents. (Fig. 4). This, also, could be construed as an example of negative heterosis. Not all measurements exhibit negative heterosis, however, for the lengths of all but the two uppermost of the lateral nerves in the hybrid are greater than the corresponding means between the parents. (Fig. 3). The condition is less extreme, therefore, but analagous to that already discovered in *Ribes* (Melville, 1960) where positive and negative heterosis occurred together in the leaf.

The reconciliation of the apparent conflict between these observations must depend in some way on an interaction between the growth-regulating mechanisms of the parents. Differences were noticed in the degree of asymmetry of the sinuses and it seemed likely that they might give some indication as to the nature of the interaction. The lateral nerves in a pinnately nerved leaf mark off zones of growth, so that the leaf may be cut up

into a series of sectors, each centred about a nerve. These sectors may be symmetrical or in varying degrees asymmetrical. In the leaves under consideration, the points of inflection of the sinuses give an indication of the asymmetry of the sectors. As a measure of the asymmetry of the sectors, determinations were made of the ratios of the normals from each nerve to the points of inflexion of the sinuses above and below. The ratio, in *Q. cerris*, fluctuates slightly about unity, so that the leaf-sectors and the sinuses were more or less symmetrical. The leaf-sectors of *Q. suber* are very asymmetrical, with a narrow band of tissue above the nerve and a broad one below. The mean of the asymmetry ratio was 8·2. The mean of the ratio for the hybrid was 1·7 and an identical ratio was found for the calculated intermediate. It is clear, therefore, that the asymmetry of the leaf segments was not the factor primarily responsible for the negative heterosis in leaf breadth.

The distances separating adjacent lateral nerves were measured along the normals from the lower of each pair at a distance from the midrib equal to 20 per cent of the lamina-length. The mean distance separating lateral nerves showed negative heterosis in the hybrid (Table 1). Such a result was to be expected from the disproportionate approximation of the lateral nerves already noted in the hybrid. It is, indeed, a restatement of the same fact in different terms.

TABLE 1. Vertical distance separating adjacent nerves at points 20 percent of the lamina-length from the midrib, expressed as percentages of the lamina-length.

Nerve pair	1–2	2–3	3–4	4–5	5–6	6–7	Mean
cerris ...	7·5	9·0	12·0	12·0	12·0	10·5	10·5
suber ...	8·5	10·0	8·5	10·0	10·0	9·5	9·4
lucombeana	8·5	8·5	9·5	9·0	7·2	7·5	8·4
calculated ...	8·0	9·5	10·2	10·2	11·0	10·5	10·1

Analytical treatment of the leaf had thus far failed to lead to any satisfactory explanation of the phenomena of interaction in the hybrid. Differences had been noticed in the relative positions of the marginal teeth of the leaves and the sinuous outline they gave to the margin, especially in *Q. cerris* and the hybrid, suggested a resemblance to a skewed sine curve. Treatment of the leaf margin as a modified sine curve made it possible to regard the leaf pattern as a unit in which the various elements that had been analysed out could be resynthesised. In this analogy with wave motion, the simple curve formed by the primary leaf-shape of a half leaf represents half of a complete undulation of a sine curve, of which the midrib forms the axis of propagation. The primary curve of the half leaf would then correspond with half a wavelength of the carrier wave of a radio wave and the serrature of the margin would be analogous to the audio-frequency modulation of this wave. A leaf with a simple serrature represents the simplest type of modulated wave in which the imposed secondary wave has the form of a sine curve, the wave length of which is the distance between successive crests. In the leaf, this secondary wave length corresponds with the distance between the tips of adjacent teeth.

In accordance with this analogy, the leaf-serratures may be treated as similar series of wave-trains. It may be noted that the tip of the first tooth of both *Q. suber* and *Q.* × *lucombeana* is 24 per cent of the lamina-length above the leaf-base whereas that of *Q. cerris* is only 14 per cent. Evidently *Q. suber* has a dominant effect on the position of this tooth. The margin of the hybrid leaf was therefore in phase with that of *Q. suber* at the leaf base, but in passing up towards the leaf-apex it became more and more out of phase (Fig. 1B, C). On the other hand, the margin of the hybrid leaf was in phase with that of *Q. cerris* at the leaf-apex, but became out of phase lower down the leaf, then in phase again at the third tooth above the leaf-base and finally was out of phase at the leaf-base. Since the number of teeth was the same in each leaf and the lateral nerves supplying the teeth were similarly spaced along the midrib (Figs. 1, 2), these phase differences were brought about by different degrees of skewing of the wave system represented by the teeth. The calculated intermediate proved to be completely out of phase with the actual hybrid. (Fig. 1C, D).

It is now possible to summarise the hybrid interaction in the light of the sine wave analogy. *Q. cerris* is dominant in the primary leaf-outline of the hybrid, which suffers comparatively slight modification towards the base from *Q. suber*. The second order wave pattern of *Q. suber* is dominant at the base of the hybrid leaf, but is modified by increasing interaction from *Q. cerris* towards the apex. The comparatively narrow primary leaf-outline is fixed by *Q. cerris*, while *Q. suber* determines the position of the first tooth above the base. The principal interaction in the hybrid leaf depends upon the primary leaf-shape and the positioning of the first tooth. These factors cause the first lateral nerve to assume a more oblique course than in either parent, making a more acute angle with the midrib. The succeeding nerves are similarly adjusted, so that all the angles are smaller and there is a general negative heterosis on this character. In comparison with *Q. cerris*, the skewing upwards of the first nerve necessitates an increase in its length. The slightly greater leaf-breadth of the hybrid results in a still further increase in the length of the nerve. At the final adjustment, the nerve length is greater, while the leaf-breadth is less than would be anticipated from the inter-parental means. This remains true of the interaction throughout the leaf, except for the two uppermost nerves, where *Q. cerris* exerts a dominant influence.

The F_2 Hybrid

Certain phenomena that occur in the F_2 or later generations of this hybrid oak support the view that the similarity of the undulations of the leaf margin to a skewed sine curve is not fortuitous. *Q.* × *lucombeana* is fertile and seedlings have been raised from it from time to time. Among these is the plant referred to earlier as *Q. lucombeana* var. *diversifolia*, which, from its morphology, probably arose by self pollination of the F_1 parent, although it might have resulted, with less likelihood, from a back cross to *Q. cerris*. The general features of its foliage were referred to in the introduction to this paper. Leaves from the middle region of the short shoots, in which a greater or lesser portion of the lamina appears to be missing, are shown in Fig. 5A, B, C & Fig. 8D. Those from the tips of these branches, with only a narrow flange of tissue along the midrib connecting the basal and apical lobes, are

depicted in Fig. 5D. Such leaves are without lateral nerves of the kind that serve the lobes of normal leaves. The nervature of the remaining portions of the leaves is poorly developed and irregular. Even the strongest of the nerves are approximately at right angles to the midrib and soon branch in an aimless manner. The characteristic pattern of the leaf has been eliminated and all that remains is a skeleton, though a skeleton of a peculiar kind.

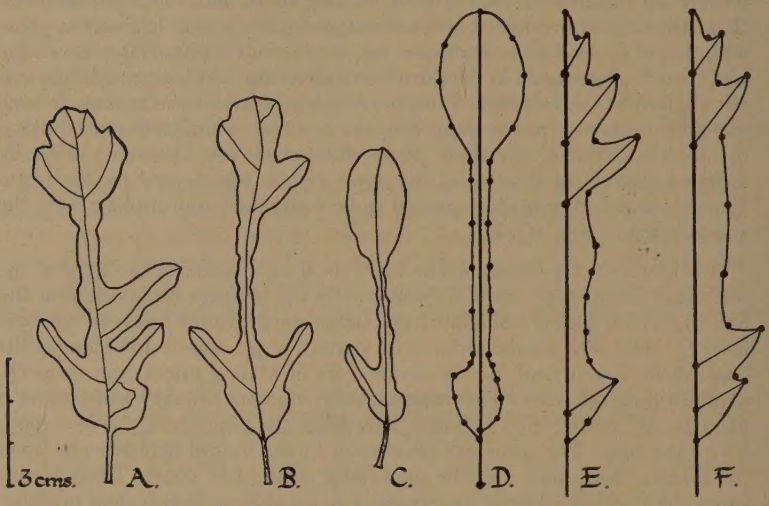

FIG. 5. A, B, C, successive leaves from a spur-shoot of *Quercus lucombeana* var. *diversifolia*, showing increasing degrees of suppression of the lamina; D, mean leaf-shape of terminal leaves in the same hybrid; E, F, the effect of block deletions of the outline of *Q. suber* from that of *Q. cerris* at different parts of the leaf-axis.

The possible modes of interaction between the leaf-patterns of the parents and the F_1 hybrid were considered as a metrical problem. At first it seemed likely that a subtraction effect was involved, possibly brought about by antagonism between a growth-promoting mechanism for the lobes of one parent and a growth-inhibiting mechanism concerned with the sinuses of the other parent. Devices such as the subtraction of the lobes of one species from the leaf pattern of the other, or of the F_1 hybrid, failed to give a residual shape in any way resembling the leaves it was intended to match. Some approach to an outline that mimicked the shape of leaves with the central portions wanting, was obtained by subtracting the leaf outline of *Q. suber* from that of *Q. cerris*, using outlines of natural size (Fig. 5E, F) instead of the standardised relative shapes measured on the decimal grid. This was not a valid treatment of the problem, however, as it represented a block deletion of a part of a leaf and not an interaction between the leaf-patterns. Moreover, it failed completely to explain the extreme form of the interaction.

As in the case of the F_1 hybrid, no piecemeal solution of the problem seemed possible. The analogy of the serrate leaf-margin to a skewed sine wave seemed promising, for, although the phase differences observed between the F_1 hybrid and its parents had proved to be due to different degrees of skewing of the wave-system, nevertheless true phase differences

might well arise in a hybrid from differences in the timing of two wave-systems of simlar wave-length or by the inheritance of two wave-systems differing slightly in wave-length. An examination of the leaf-spectrum of the short shoots of *Q. lucombeana* var. *diversifolia* provided evidence for the belief that interactions of the kind postulated do, in fact, occur. The basal leaves of these shoots exhibit a normal type of hybrid interaction, similar to that found in all leaves of F_1 *Q.* × *lucombeana*, the middle leaves have median deletions of the lamina and the terminal leaves are of the extreme type with only small basal and apical lobes. The interactions along the shoot are graded, therefore, in a manner comparable with those along the leaf-axis in the F_2 hybrid.

The final shapes of mature leaves are the result of a series of growth processes, but it appeared likely that the interactions responsible for deletions of parts of leaves took place in a relatively early phase of leaf-development. Buds of *Q. cerris* were dissected and the leaf-initials were examined at all stages of growth. The leaf-initial was first distinguishable as a mound of tissue on the apical meristem. It elongated into a slightly flattened blunt cylinder, which was featureless until it reached a length of about 0·2 mm. By the time it had reached a length of 0·4 mm. the lateral margins had become crenate. The crenated leaf-margin at this stage bore a strong resemblance to a sine curve, which was already skewed slightly towards the leaf-apex (Fig. 6A). As growth proceeded, the lateral crenations elongated into finger-like processes. By the time the leaf-initial had reached a length of 1·0 mm., these processes, in turn, began to show occasional crenations of their margins (Fig. 6B) which ultimately developed into small lateral teeth on principal lateral lobes of the adult leaf. The principal features of the leaf had already been determined by the time the leaf was 1·0 mm. long. Some further growth in size took place until the leaf-initials had reached a length

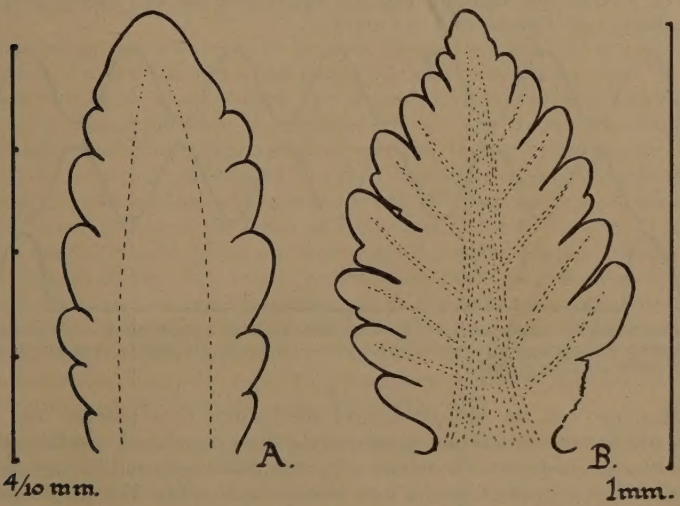

FIG. 6. Leaf-initials of *Quercus cerris* L. A, an early stage with crenated margins approximating to skewed sine-curves. B, later stage with some of the lateral lobes crenated.

of 2–3 mm., at which stage the buds became dormant. Subsequent development in the following year consisted mainly in the enlargment of the leaf, without the introduction of any new features. An examination of other species of *Quercus* and *Ulmus* showed that the leaf-initials became crenated at a correspondingly early stage and that all of the essential shape-features of the leaves were determined some time before the buds became dormant.

There now seemed to be some basis for elaborating the analogy of the leaf margin with a sine curve into a sine wave theory of leaf morphogenesis, which could be examined theoretically and the theoretical results compared with actual leaf-shapes. The crenations on the margins of the leaf-initial occurred at those points where the major teeth or lobes of the leaf developed, together with the principal lateral nerves which supplied them. The crenations appear to indicate the points at which, in the immediately preceding phase of development, concentrations of growth-promoting hormones had been present. The appearance of the leaf-initial at the crenate phase suggests that the concentration gradient of these morphogens along the leaf-axis may have had the form of a sine curve. It does not seem possible to explain the phenomenon of deletion of parts of the leaf-lamina unless growth inhibiting substances also play a part in leaf-morphogenesis. In pinnate leaves such as those of *Q. cerris* it is probable that concentrations of growth-inhibitors occur in positions that alternate with those of the growth-promoting morphogens and correspond, in the adult leaf, with the positions of the sinuses between the teeth. These growth-inhibitors may be similarly distributed along the leaf-axis in the form of a concentration gradient having the form of a sine curve. In a normal leaf, the two concentration gradients must be balanced in a manner characteristic of the species concerned and the interval between the wave-crests of the two systems must be the same. They can be represented as extending along the leaf-axis in the manner of the two wave-trains in Fig. 7 A, B, but superimposed. In this system the two wave-trains are completely out of phase with one another.

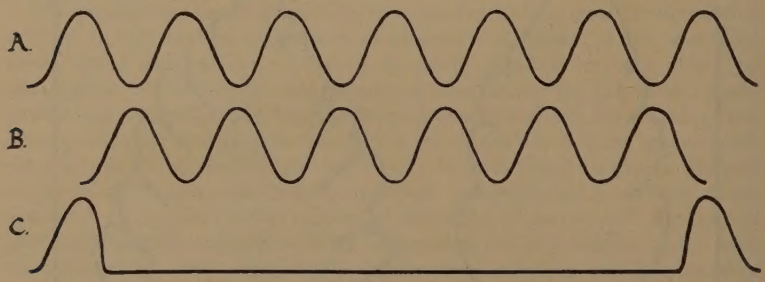

FIG. 7. A & B, two sine-curves of identical wave-lengths, but completely out of phase. C, suppression of the wave form by interaction of two wave-trains of similar wave-length when out of phase with one another.

Assuming that the growth control mechanism of a pinnate leaf can correctly be represented by a system of the kind postulated, several deductions may be made as to the nature of specific differences and the manner in which different pairs of species may interact in hybrids. The amplitude of the wave-trains may vary from one species to another and so alter the relative sizes of the teeth and depths of the sinuses. If the wave-systems of

both parents have the same wave-length, the timing of the metabolic processes controlling them may be different. In such circumstances it would be possible in the hybrid for the inherited wave-trains of growth-promoting and growth-inhibiting hormones to be out of phase to varying degrees and so cause the inhibition of parts of the leaf-lamina. In the event of the two sets of wave-trains having different wave-lengths, their interaction, of necessity, would be irregular and at certain points along the leaf-axis inhibition of part of the lamina could be expected. Various combinations of these three potential methods of variation may also be envisaged.

Conditions that would lead to complete suppression of the lamina would be produced if the wave-trains of growth promoting and growth-inhibiting morphogens had the same wave-length and were in phase with one another. In the normal leaf the two wave-trains are a half cycle out of phase as are the two wave-trains shown in Fig. 7A, B. If they were in phase, the inhibitor should counteract the growth promoting hormone and suppress the growth of the lamina. This condition is represented by Fig. 7C, excluding the crests at either end. It is presumed to correspond with situation that arises in the leaf-initials of those leaves of *Q.* × *lucombeana* var. *diversifolia* which develop without any lamina except for the small basal and apical lobes (Fig. 5D). The existence of these lobes also calls for explanation. They do not appear to be due directly to a failure of the inhibiting system at the leaf-base and apex, because they possess no lateral nerves of the kind that serve the principal lobes of the leaf. They are provided only with small, irregularly developed nerves corresponding with those that form laterals to the main lateral nerves from the ramifications of which the reticulum is derived. In the ontogeny of the leaf, these minor nerves do not develop until some time after the main lateral nerve-system has been laid down. They belong to a later phase of leaf-development. The existence of basal and apical lobes, however, could have been conditioned in an earlier phase in leaf-ontogeny.

An analogy was drawn earlier between the primary leaf outline (Fig. 1A, full line) of a half leaf and a half wave-cycle of a radio carrier wave. In the theory now under consideration, the primary leaf outline would be determined by an accumulation of morphogens at an early stage in the development of the leaf initial. This pool of morphogens represents the primary half wave, destined to be modulated by super-imposition on it of the secondary wave-train, which initiates the marginal teeth. The base and apex of the leaf-initial would represent the nodes at either end of the half wave. As these nodes are determined before any interaction has taken place to inhibit the development of the intervening tissues, a residuum of growth-promoting morphogens may be expected to remain at the base and apex. The condition in the leaf-initial after the interaction and suppression of the intervening wave-system is represented in Fig. 7C. The residual basal and apical accumulations of growth promoting morphogens would account for the development of the basal and apical lobes (Fig. 5D).

In considering lesser degrees of suppresion of the lamina than the complete elimination of the lateral lobes, attention must be directed to variation in the number of lateral nerves. In both *Q. cerris* and *Q. suber* the number fluctuates around 7 on either side of the midrib. Leaves with 6 nerves on one and 7 on the other often occur. Thus it would appear, that interactions of

the third class defined above (p. 171) would be possible in hybrids of this pair of species. As an example may be taken the interaction between a wave-train of six waves, representing the concentration gradient of growth-promoting morphogens, and one of seven waves, representing the growth-inhibitor. In Fig. 8A a wave-train of 6 cycles is shown and below (Fig. 8B) a wave-train of 7 cycles of the same overall length. The two wave-trains are in phase at the mid point. The form of the resultant wave produced by the interaction of the two wave-trains is shown in Fig. 8C. The portion above the axial line (shaded) represents accumulations of growth

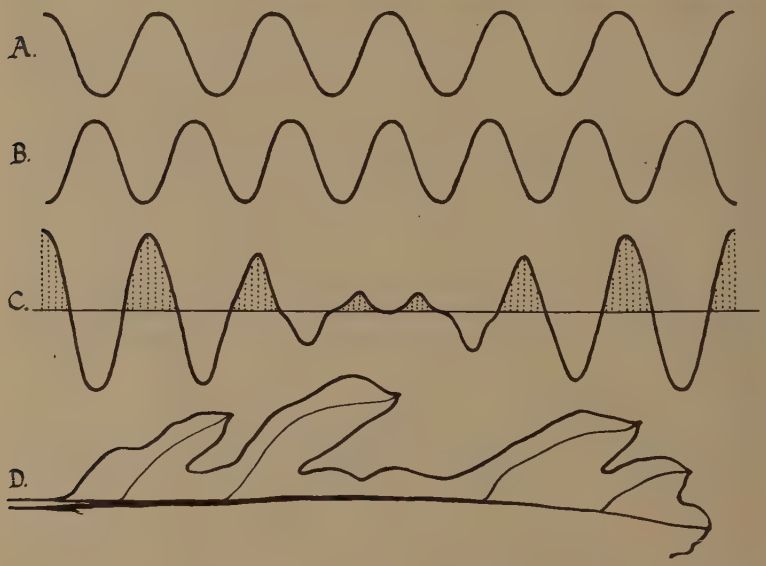

Fig. 8. A, sine-wave train of six cycles representing the axial gradient of a growth-promot ng morphogen in a leaf-initial. B, a sine-wave train of seven cycles of the same overall length as A, representing the axial gradient of a growth inhibiting morphogen in a leaf initial. C, the wave-form produced by the interaction of two wave-trains of six and seven cycles respectively. The dotted portion above the axial line is positive and may represent the residual concentration gradient of a growth-promoting morphogen in a leaf-initial. D, Actual form of a half leaf of *Quercus* × *lucombeana* var. *diversifolia*, enlarged.

promoting hormones, that below (unshaded) the inhibitor. The form of the residual curve for the growth promoting hormones may be compared with actual leaf-shapes. The outline of an actual half leaf (Fig. 8D) is shown enlarged to cover the same axial scale. Although in the leaf the curve is skewed towards the apex, the principal features of the theoretical curve are reproduced. In the centre, two small undulations of the leaf-margin correspond with the positions where small residuary accumulations of growth-promoting hormones would be expected. On either side is a pair of lobes supplied with normal lateral nerves which are wanting from the appropriate places below the central undulations. Presumably, at these points the concentration of growth-promoting hormones had not reached a level high enough to stimulate the development of lateral nerves. The broad flat based

sinus between the first and second lobes above the leaf-base may also be noted. It is unlike the rather acute sinus of the F_1 hybrid (Fig. 1C) and corresponds in position with a considerable accumulation of growth-inhibitor in the theoretical curve. The correspondence is close enough to suggest that this particular leaf was the result of a 6/7 wave train interaction. It is clear also that, as the wave-lengths of the two wave-trains approximate more closely to one another, greater and greater portions of the lamina would be suppressed until, with equal wave-lengths, all of the lobes would be eliminated The theory, therefore, is capable of accounting for the whole range of leaf-shapes with varying degrees of suppression of the lamina.

Discussion

Comparison of the primary leaf-shapes of the parents with that of the F_1 hybrid provided the simplest method of asssessing the generalised leaf-shape interactions. *Q. suber* was found to be dominant at the leaf-base and *Q. cerris* at the leaf-apex, with a gradual change in relative dominance along the leaf-axis in between. This phenomenon of graded dominance along the leaf-axis was similar to that previously discovered in *Prunus* and other genera (Melville, 1960). It may be common to other oak hybrids, though little evidence on this point can be gleaned from published work concerned with the discussion of other problems. From illustrations of the leaves of *Q. virginiana*, *Q. lyrata* and their hybrids examined by Yarnell (Yarnell, 1933), it is probable that the leaf-shape interactions were affected by graded dominance.

No published reports have been seen of hybrid interactions in oak leaves involving the suppression of parts of the lamina. In the case of *Q.* × *heterophylla* discussed by MacDougal (1907), the absence of this type of interaction may be due to the wide diversity of the growth patterns of the parents, for *Q. phellos* has leaves with few lateral nerves and *Q. borealis* many. From the point of view of the sine-wave theory of morphogenesis, it would be anticipated, that in their hybrids the wave-length difference between the inherited sine-wave like concentration gradients of morphogens in the leaf initials would be too great to allow of the suppression of part of one wave system by the other. The suppression of sectors of leaves is known to occur only in the hybrids of species pairs that differ little in the number of lateral nerves in their leaves and their spacing along the leaf-axis. *Q.* × *lucombeana* conforms to this criterion as does *Q.* × *kewensis* Osborn (*Q. cerris* L. × *wislizenii* A. DC.) in which parts of leaves normally served by several lateral nerves may be wanting. Elsewhere, this phenomenon has been illustrated in the *Venidium* × *Arctotis* hybrids synthesised by Warren (1931) and the *Fagus* hybrid studied by Klastersky (1955). An example in the fern, *Pteris* × *otaria* Bedd. was referred to by Walker (1958) and discussed by Melville (1957).

The hybrids prepared by Warren consisted of the F_1, F_2 and backcross generations between *Venidium wyleyi* Harv. and *Arctotis stoechadifolia* Berg. Both parents have pinnatisect to pinnatipartite leaves, the basal segments of which decline to insignificance. If the primary leaf-shapes were drawn, they would be obovate-cuneate in the *Venidium* and oblanceolate-cuneate in the *Arctotis* (Fig. 9A, B). Several degrees of elimination of the lobes were represented in different individuals, but the most extreme condition occurred in certain back crosses to *Arctotis*. The lamina in these consisted of a broad

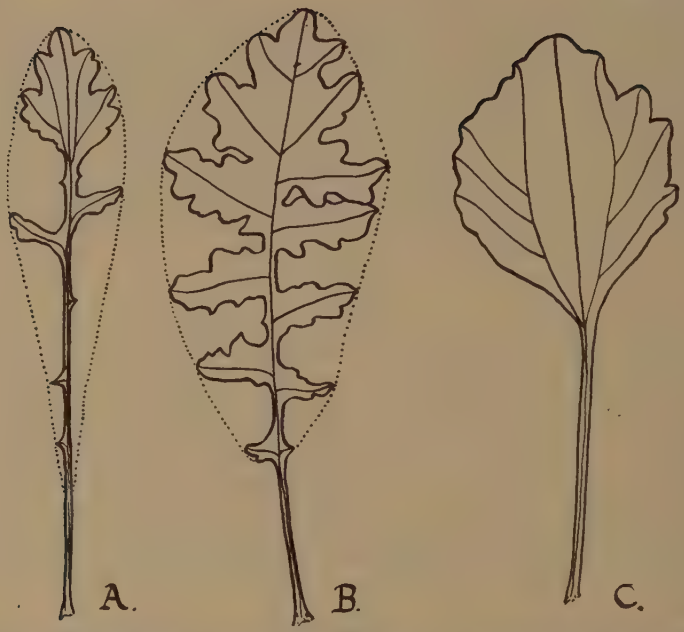

FIG. 9. Leaf-shapes of A, *Arctotis stoechadifolia* Berg.; B, *Venidium wyleyi* Harv., with the primary leaf-shapes dotted. C, leaf-shape of an *Arctotis* × *Venidium* hybrid backcrossed to *Arctotis*. (Modified after Warren).

apical lobe, similar in general shape to the apical lobe of the *Arctotis* parent, with a long petiole devoid of lateral lobing. By analogy with the leaves of *Q. lucombeana* var. *diversifolia* the lamina of these leaves (Fig. 9C) represents the terminal node of the leaf-initial, but the basal node is not represented by any expansion of the lamina. This is consistent with the sine-wave theory, since in neither parent is there any expansion of the lamina at the base of the leaf. In such circumstances an interaction of the kind postulated should suppress all of the lamina except the apical lobe.

The beech discussed by Klastersky was a hybrid between the copper beech, *Fagus silvatica* L. f. *atropurpurea* and a cut-leaved beech with green leaves, *F. silvatica* L. f. *quercifolia* Schneider. The hybrid, known as *F. silvatica* L. var. *rohanii* Körber, has red leaves, which vary erratically in shape, but frequently show deletions of parts of the lamina. Small rounded lobes sometimes terminate the principal axis, the midrib, and, more frequently, the lateral axes formed by the lateral nerves, with the lamina suppressed to varying extents below. Many of these effects could be the result of interactions between genetically controlled growth systems, but there are, in addition, numerous irregularities of shape that suggest erratic interference by some other factor. Klastersky suggested that a virus is responsible for these effects. Sometimes the apical lobes are cowl-shaped, a feature that previously he had found to be associated with a virus in the leaves of roses, limes and elms (Klastersky, 1951). It is probable that the somewhat irregular

kind of leaf-dissection found in one parent, *F. silvatica* f. *quercifolia*, is also due to a virus, which may have been passed on by the seed, to its offspring var. *rohanii*.

It is important to distinguish between genetically controlled interactions and the effects of virus diseases and mineral deficiencies, which, also, may be the cause of the suppression of the lamina to varying extents. Where the phenomenon is under genetical control, the shape-changes in successive organs follow some regular sequence and conform to some definite plan, as in *Q. lucombeana* var. *diversifolia*. When a virus interferes with the growth control mechanism the shape-changes are erratic. The diverse leaf-shapes in tomatoes, that result from infection by mosaic disease, are good examples. Varying degrees of suppression of the lamina occur in this disease, the 'fern-leaf' symptom being the extreme form in which the leaf is reduced to a rachis with bare thread-like lateral nerves. Here, presumably, the plant has lost control of its growth mechanism. A similar loss of control appears to take place in the physiological disorder of cultivated *Brassica* crops due to molybdenum deficiency, which results in the whiptail symptom. The excellent photographs of whiptail in brocoli and cauliflowers published by Plant (1951) show somewhat irregular deletions of the lamina, with well developed and normally oriented lateral nerves in the vestigial portions of the lamina. Apparently, in whiptail disease, there is little interference with the mechanism controlling the initiation of the lateral nerves, but considerable disorder in that concerned with the expansion of the lamina. There is evidence therefore that the pathological interference with the growth-mechanisms of leaves can take place and consequently, the combination of pathological interference with suppression of parts of the lamina from causes under genetical control is a possibility. It is probable that this combination is responsible for the diversity of leaf shape in *F. silvatica* var. *rohanii*.

The regularity of many of the interactions in the *Q. lucombeana* hybrids and the fact that others, which at first appeared to be irregular, were later proved to resemble the interaction of sine-wave systems, is evidence for the rhythmic nature of the morphogenetic processes that gave birth to them. Such regular processes must be under genetic control and are not likely to be the result of pathological interference. In the past, Liesegang phenomena have been considered as likely causes for rhythmic processes in plants. The part they play in biological processes has been discusssed by Darcy Thompson (1942), but their rhythm is of a different kind from that of normal growth processes. The intervals between Liesegang rings increase progressively, whereas the intervals between successive lateral crenations on such leaf-initials as those of *Quercus* are remarkably constant. Subsequent growth soon masks this relationship in most plant organs (Fig. 6). The uniformity of successive growth units is beautifully exemplified in the wave-like pattern of developing grass inflorescences such as that of the *Lolium* illustrated by Cooper (1951). It is unlikely that these regularities are produced by a precipitation process. In meristematic tissues it is more probable that only diffusible substances are involved and a satisfactory physical explanation must be capable of explaining how such mobile substances can come to be arranged in a sine-wave like gradient.

A theory that would fulfil these requirements was found in Turing's

Diffusion Reaction theory of morphogenesis (Turing, 1952). Turing examined mathematically the conditions that exist in a ring of tissue containing diffusable substances that were assumed to be momentarily uniformly distributed. He showed that such a system is unstable and that the concentrations of the mobile materials around the ring must rise and fall like a sine-wave if they are to comply with the laws of diffusion. The distance between adjacent concentration peaks—the wave-length of the system—was shown to depend on the number and nature of the substance taking part, but it is constant for a particular system. Thus, the number of concentration peaks that could be formed in a ring of a particular size was fixed by the 'chemical wave-length' of the system. The sine-wave like concentration gradient so determined could take the form of either a stationary wave or of a moving wave. Turing indicated that the conditions necessary for a diffusion-reaction system of this kind could occur in plant meristems and that the whorled arrangement of the leaves of *Asperula odorata* L. and other *Rubiaceae* could be so explained. He also stated that wave-like concentration gradients could arise in linear organs provided their size was not too great for diffusion-reactions to occur. The upper limit of size was of the order of 3·0 mm. Since some time must elapse for growth to make manifest the antecedent diffusion wave, the length of the leaf-initial in which the diffusion reaction occurs in *Q. cerris* must be less than that shown in Fig. 6A and probably of the order of 0·2–0·3 mm. The leaf-initial at the appropriate phase is therefore well within the size range demanded by the theory.

Turing's Diffusion-Reaction theory provides the necessary physico-chemical background to the sine-wave theory of morphogenesis elaborated in this paper. Once the mechanism for the development of sine-wave like concentration gradients of diffusable morphogens is accepted, the probability of interactions between separately inherited wave-patterns in hybrids must follow as a necessary corollary. That interactions of this nature can and do occur appears to be established by the phenomena described above in *Q. lucombeana* var. *diversifolia*. The theory also provides an explanation for the behaviour of the leaf as a unit during its development and for the failure of analytical methods to account for some of the leaf-shape interactions.

Summary

1. A metrical study was made of the leaf-shapes of the F_1 hybrid (*Q. lucombeana*) between *Quercus cerris* and *Q. suber* and of a particular F_2 hybrid of the same parentage (*Q. lucombeana* var. *diversifolia*).
2. In the F_1 hybrid, graded interaction, with change of dominance between the parental effects, was observed along the leaf-axis.
3. The F_1 hybrid leaf is narrower than the theoretical intermediate and the lateral nerves are skewed upwards. The reasons for these effects are discussed.
4. Suppression of the lamina of the leaf to varying extents occurred in the F_2 hybrid. A sine-wave theory of leaf morphogenesis is proposed to account for these effects.
5. The relationship between this sine-wave theory and Turing's Diffusion-Reaction Theory of morphogenesis is discussed.

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A new Directory of Natural History Societies.—We welcome the appearance of this useful and well-produced volume*, taking the place of the Directory published in 1948 (with Supplement 1949) by the Amateur Entomologists' Society. Its scope has been widened to include also societies with purely archaeological, astronomical or meteorological interests, but defunct societies, and the societies of Éire, are omitted. We hope that, under the auspices of the British Association and the Carnegie Trust, the publication of this Directory may become a regular event.

H. K. Airy Shaw

* *Directory of Natural History and other Field Study Societies in Great Britain, including societies for archaeology, astronomy, meterology, geology and cognate subjects.* Edited by A. Lysaght. Pp. xi + 217. Published for the Carnegie United Kingdom Trust. London: The British Association for the Advancement of Science, 1959. Price 20/-, interleaved 25/-.

New and noteworthy Cassias from Tropical Africa: II*

J. P. M. Brenan

Cassia fallacina *Chiov.* in Res. Sci. Miss. Stefan. Paoli **1** (Coll. Bot.), 68 (1916); Bak.f., Leg. Trop. Afr. 641 (1930); Ghesquière in Bull. Jard. Bot. Brux. **9**, 144 (1932), pro parte, excl. varietates.

Somalia. Giumbo, 20 June 1913, *Paoli* 286 (FI, holotypus). Medio Scebel [?], 24 July 1922, *R.A.Q.* 25 (FI).† Abundant in grassland near the Giuba, *F. Bigi* 17 (FI).

Kenya. Kwale District: about 1·6 km. from the Tanganyika border on the Tanga–Mombasa road, c. 100 m., 14 Aug. 1953, *Drummond & Hemsley* 3766 (EA, K).

Tanganyika. Masai District: Tarangire R., 23 Feb. 1958, *Lamprey* 332. Mpwapwa District: Kongwa, 1160 m., 2 Feb. 1950, *Anderson* 607 (EA, K).

True *C. fallacina* has hitherto been known only from Somalia. Ghesquière (*l.c.*, *supra*) did indeed make two varieties of *C. fallacina* from the Belgian Congo and Tanganyika, but both were subsequently, and I am sure correctly, specifically separated by Steyaert.

Thanks to the courtesy of Dr. Guido Moggi, of the Istituto Botanico at Florence, three specimens of *C. fallacina* including *Paoli* 286, the holotype of the species, were kindly lent for examination. They were uniform taxonomically and match excellently certain specimens, cited above, from Kenya and Tanganyika, enabling the known geographical range for *C. fallacina* to be thus considerably extended.

The unusually long stalk to the petiolar gland (1–2·25 mm.), the small leaflets with a marginal midrib, and the pedicels only about 4–6 mm. long make *C. fallacina* an easily recognised species.

Cassia falcinella *Oliv.* in Fl. Trop. Afr. **2**, 281 (1871); Bak.f., Leg. Trop. Afr. 641 (1930); Ghesquière in Bull. Jard. Bot. Brux. **9**, 162 (1932), excl. var. *longifolia*; Steyaert in Fl. Congo Belge **3**, 520 (1952).

This species is variable. Ghesquière (*l.c.*, *supra*) made a var. *longifolia*, which is now no longer considered conspecific, while Steyaert, in Bull. Jard. Bot. Brux. **20**, 251 (1951), separated var. *parviflora*. *C. falcinella* appears to be satisfactorily divided into three varieties, as follows:—

Petals rather large, 7–10 mm. long, 4·5–10 mm. wide:
  Surface of stipules thinly pubescent to glabrous; leaflets in up to 10 pairs . . . . . var. *falcinella*
  Surface of stipules densely though often shortly pubescent; leaflets in 8–14 pairs . . . . . var. *intermedia*
Petals smaller, 4–6 mm. long, 2–5 mm. wide . . . . . var. *parviflora*

* Continued from Kew Bull. **13**, 252 (1958).

† Probably collected, according to information kindly sent by Dr. G. Moggi, by a member of the retinue of the Duke of Abruzzi, near Villaggio Duca degli Abruzzi in Somalia.

var. **falcinella**

Herba perennis, caudice lignoso, caulibus erectis. *Folia* 0·7–2 cm. longa; superficies externa stipularum tenuiter pubescens usque subglabra; glandula petioli parva, 0·5–0·7 mm. longa, 0·4 mm. lata; foliola 5–10-juga. *Petala* 8–10 mm. longa, 5–10 mm. lata.

Belgian Congo. Nyabisindu, 20 Nov. 1953, *Liben* 975.

Uganda. Ankole District: near Mulema, 31 Mar. 1904, *Bagshawe* 190 (BM):—wiry shrub 30 cm. high. Kigezi District: Kamwezi, 1520 m., Feb. 1948, *Purseglove* 2587 (EA, K).

Kenya. Machakos/Masai Districts: Chyulu Hills, 1580 m., 23 Apr. 1938, *Bally* 313 *in C.M.* 8224 (EA, K).

Tanganyika. Bukoba District: Karagwe, *Speke & Grant* 445 (K, holotypus). Karagwe, near Nyakahanga, 1520 m., Oct. 1931, *Haarer* 2269 (EA, K).

var. **intermedia** *Brenan*, var. nov.

Herba perennis, caudice lignescenti, caulibus erectis usque ad 1 m. altis. *Folia* 1·5–4 cm. longa; superficies externa stipularum dense sed saepe breviter pubescens; glandula petioli 0·5–1·25 mm. longa, 0·4–0·7 mm. lata; foliola 8–14-juga. *Petala* 7–8·5 mm. longa, 4·5–7 mm. lata.

Tanganyika. Buha District: W. of the Mlagarasi, c. 1060 m., 1 Feb. 1926, *Peter* 36014. Ufipa District: Sopa village, 1590 m., 13 Dec. 1956, *Mrs. Richards* 7245. Mpui, 1800 m., 15 Mar. 1957, *Mrs. Richards* 8746. Lake Kwela, 1800 m., 16 Mar. 1957, *Mrs. Richards* 8760. Plentiful at Lake Kwela, 19 km. from Mpui, and seen by roadsides throughout Ufipa District, 1710 m., 14 Mar. 1959, *Miss M. McCallum Webster* T1 (K, holotypus varietatis): —0·6–1 m., perennial, erect. Mbeya District: Mbozi, 1220 m., 7 Apr. 1932, *R. M. Davies* 523 (EA, K).

Northern Rhodesia. Abercorn District: Old Kasama road, close to Pans, 1520 m., 4 Apr. 1952, *Mrs. Richards* 1302. Abercorn, old road between Pans, 1520 m., 22 Mar. 1955, *Mrs. Richards* 5051. Roadside 3 km. from Kawimbe Settlement and 16 km. from Abercorn, 1770 m., 3 Mar. 1959, *Miss M. McCallum Webster* 9:—60 cm. high, perennial; gland 1 mm., green, sessile, oblong, slightly raised; leaflets with central midrib; one plant only seen.

var. **parviflora** *Steyaert* in Bull. Jard. Bot. Brux. **20**, 251 (1950); Steyaert in Fl. Congo Belge **3**, 521 (1952).

Herba annua vel caulibus inferne supra terram lignescentibus. *Folia* 1–6 cm. longa; superficies externa stipularum breviter pubescens vel subglabra; glandula petioli 0·3–0·5 mm. longa, 0·2–0·5 mm. lata, orbicularis vel suborbicularis; foliola 6–17(–18)-juga. Petala 4–6 mm. longa, 2–5 mm. lata.

Belgian Congo. Ruanda-Urundi, Gabiro, 1400 m., May 1933, *Becquet* 613 (BR, holotypus varietatis).

Uganda. Karamoja District: Napak Mountain, June 1957, *Wilson* 358.

Kenya. Trans-Nzoia District: Hoey's Bridge, 1800 m., Aug. 1931, *Jex-Blake in C.M.* 2581 (EA). Uasin Gishu District: Kipkarren, *Mrs. Brodhurst Hill* 50 *in C.M.* 2482 (EA, K).

Tanganyika. Mwanza District: Mwanza, *R. L. Davis* 278. Lubili, Mbarika, 1160 m., 24 May 1953, *Tanner* 1540. Masai District: Ngorongoro–Laroda, 1770–1780 m., 23 Aug. 1926, *Peter* 43157. Ngorongoro Crater floor, Siedentopf's Farm, 9 Jan. 1941, *Bally* 2271 *in C.M.* 16460 (EA). Ardai Plains, *Fuggles Couchman* 6 (EA). Ardai Plains, 1370 m., 29 June 1945, *Greenway* 7504 (EA, K). Mbulu District: Karatu, 30 Sept. 1949, *van Rensburg* 189 (EA). Kondoa District: Sambala, 1490 m., 2 May 1929, *B. D. Burtt* 2015 (BM) & 23 Mar. 1929, *B. D. Burtt* 2129 (BM):—erect herb 45 cm. high, in old cultivations. Dodoma District: about 8 km. S. of Dodoma, 1200 m., 19 July 1956, *Milne-Redhead & Taylor* 11181. Mpwapwa District: Mpwapwa, 1070 m., 1930, *Hornby* 249 (BM, EA, K). Kongwa, *Lea* 9 (EA).

Southern Rhodesia. Nyamandhlovu: 12 Feb. 1948, *West* 2684 *in S.R.G.H.* 25649. Same locality, 7 Mar. 1953, *Plowes* 1556 *in S.R.G.H.* 42171. Bulalima-Mangwe: Plumtree–Embakwe, 20 Mar. 1942, *Feiertag in S.R.G.H.* 45361. Urungwe; 1·5 km. N. of R. Memora, c. 610 m., 28 Feb. 1958, *Phipps* 945.

Northern Rhodesia. Southern Province, Livingstone District: near Maramba R., 11 Mar. 1952, *White* 2235.

Cassia brevifolia *Lam.* and its relatives.

C. brevifolia was first described by Lamarck (Encycl. Méth. **1**, 651: 1785). Its leaves were said to be very short, only 5–6 lines long, and to be composed of 12 or rarely 14 pairs of very small leaflets. No mention was made of any gland on the leaf. *C. brevifolia* was said to grow in Madagascar and to have been observed there by Commerson, who presumably collected the specimen described by Lamarck. For over a century little was added to our knowledge of the plant; then Scott Elliot, in Journ. Linn. Soc. **29**, 14 (1891), announced that he had refound the species in open sandy soil at Fort Dauphin (*Scott Elliot* 2429, 2446). Drake del Castillo, Hist. Pl. Madag. **1**, 93 (1902), described the species again, citing in addition to Commerson other specimens collected by Bojer and Lantz, but not mentioning Scott Elliot.

The next development was a detailed discussion of *C. brevifolia* by Ghesquière in Bull. Jard. Bot. Brux. **9**, 162 (1932). The only specimen cited was from 'Madagascar: 1826, communic. *A. de Jussieu*.', which presumably could not have been the type of the species, although, according to Mlle. Dumaz-le-Grand, there is a specimen of *C. brevifolia* in the Herbarium of A. de Jussieu at Paris numbered 14587 and originating from Commerson's herbarium. Ghesquière has some important comments on the petiolar gland of *C. brevifolia*: 'Le pétiole n'est pas toujours églanduleux comme l'indique de Lamarck; ce détail à pu échapper au descripteur, examiné au diam. 80, le pétiole s'est montré parfois porteur d'une minuscule glande allongée ± bilabiée et enfoncée dans les replis du tissu épidermique.' Lamarck, however, as we have already said, did not describe the petioles of *C. brevifolia* as eglandular: he simply did not mention the gland. Ghesquière also suggested that *C. exilis* Vatke in Oesterr. Bot. Zeitschr. **30**, 80 (1880), based on *Hildebrandt* 963 from Zanzibar, might be synonymous with *C. brevifolia*. The type of *C. exilis* has been destroyed and its identity is not free from doubt. There are, however, some significant discrepancies between Vatke's description of *C. exilis* and Lamarck's of *C. brevifolia*: branches spreading-pilose or pubescent (Vatke) as against plant subglabrous (Lamarck); leaflets 4–9-jugate (Vatke) as against 12(–14)-jugate (Lamarck). In view of these differences and of examination of specimens of the true *C. brevifolia* sent from Paris, it seems unlikely that *C. exilis* and *C. brevifolia* are synonymous, although more collecting in Zanzibar is necessary to establish the identity of *C. exilis* with certainty. It is likely that *C. exilis* is a distinct and valid species, confined to the coast of East Africa. This matter will, however, be considered in more detail in the treatment of *Cassia* for the 'Flora of Tropical East Africa'.

In 1950 Steyaert, in Bull. Jard. Bot. Brux. **20**, 266–7, announced that he had identified with *C. brevifolia* a Kenya specimen (*Chandler* 2330, Kinangop). Since then other East African specimens at Kew have also been determined as *C. brevifolia*. Steyaert stated that *Chandler* 2330 had been compared with the plant from Madagascar in Herb. Hooker bearing the label of *C. pumila* Lam., but there seems no evidence that Steyaert had examined Lamarck's type of *C. brevifolia*.

While checking, for the 'Flora of Tropical East Africa', the identity of East African material named *C. brevifolia*, it seemed desirable to make sure that it was the same as Madagascar specimens at Kew so named. After excluding

from the latter misidentified specimens of *C. mimosoides*, I was surprised to find that the residue comprised three apparently distinct species each one of which might perhaps be the true *C. brevifolia* of Lamarck, but of which none exactly matched the East African material. In order to find out the true *C. brevifolia*, I wrote to Mlle. N. Dumaz-le-Grand, of the Muséum National d'Histoire Naturelle at Paris, enclosing fragments and asking whether comparison might be made with Lamarck's type. Mlle. Dumaz-le-Grand, for whose care and generous help over this matter I am extremely grateful, replied in detail and most helpfully, enclosing also 'un spécimen de Commerson, *absolument identique* [sic] au type de Lamarck', and adding that 'il y a très fortes chances pour que les 2 échantillons proviennent de la même plante.' I am further indebted to Mlle. Dumaz-le-Grand for kindly reading through the text of this paper and suggesting several useful improvements.

As a result it now seems feasible to sort out *C. brevifolia* from its relatives, and the following key is therefore proposed.

Key to *Cassia brevifolia* and its relatives

Petioles wrinkled, without any obvious gland (even under a × 20 lens); leaf-rachis crenate-crested along upper side:

Plant somewhat puberulous on stems, leaf-rhachides, pedicels and pods . . . . . *C. brevifolia* var. *brevifolia*

Plant quite glabrous . . . . . *C. brevifolia* var. *glabra*

Petioles not or scarcely wrinkled when dry, all or most of them with an obvious projecting gland when viewed under a × 10 lens; leaf-rhachis channelled but not crenate-crested along upper side:

Leaves and stipules with spreading hairs about 0·5–0·75 mm. long; pedicels 0·5–1·1 cm. long; stipules about 0·75 mm. wide; gland on petiole about 0·15–0·25 diam. . . . . *C. reducta*

Leaves and stipules with shorter appressed hairs up to about 0·5 mm. long, or else glabrous; pedicels 1·5–3 cm. long:

Stipules ovate, 2–3·5 mm. wide near base; gland about 0·3–0·5 mm. long; stem hairy along one side only; leaflets in 2–5 pairs *C. dumaziana*

Stipules lanceolate, 0·75–2 mm. wide near base; gland about 0·1–0·2 mm. long; stem hairy all round; leaflets in 5–11(–13) pairs *C. usambarensis*

Cassia brevifolia *Lam.*, Encycl. Méth. **1**, 651 (1785)

var. **brevifolia**

Caules, rhachides foliorum, pedicelli et legumina inconspicue appresse puberuli.

Madagascar. Without precise locality, *Commerson* (P–LA, holotypus speciei, haud visus, P).

The specimen kindly sent to me for examination by Mlle. Dumaz-le-Grand (see above) has an indumentum of closely appressed puberulence extending along one side of the stems. The leaves are up to 1 cm. long, with 5–10 pairs of leaflets up to 3·5 mm. long and about 1·24 mm. wide, with the

somewhat excentric midrib and venation prominent beneath. The pedicels are about 1·2–1·6 cm. long.

In spite of Ghesquière's observation, under a magnification of 80 times, of a diminutive *sunken* petiolar gland, I have not succeeded in seeing such a gland as this myself. However, while dissecting a leaf of *C. brevifolia* var. *glabra* in a very young unexpanded state, I have observed under a magnification of × 25 a minute irregular filiform structure projecting from the petiole in the position where a gland might be expected. Whether this is a gland or not, it has disappeared by the time the leaf expands.

There is a specimen of *C. brevifolia* in the Smithian Herbarium of the Linnean Society of London, collected in Madagascar by Commerson and most probably an isotype. It has up to 13 pairs of leaflets.

var. **glabra** *Brenan*, var. nov.

Planta omnino glabra.

Madagascar. Fort Dauphin, Apr., *Scott Elliot* 2429 (K, holotypus varietatis, BM, isotypus).

A fragment of *Scott Elliot* 2429 was sent to Mlle. Dumaz-le-Grand, who kindly commented on it as follows: 'Je ne peux rattacher au *C. brevifolia* l'échantillon *Scott Elliot* 2429 car il s'oppose au *C. brevifolia* par son absence de pilosité sur les tiges, les petioles . . . les gousses, bien qu'il s'en rapproche par son absence de glandes et sa nervation proéminente à la face inférieure des folioles et à la face externe des stipules.'

I agree entirely with these comments. However, as far as the rather limited material available enables one to judge, *Scott Elliot* 2429 differs from *C. brevifolia* solely by the absence of indumentum, and for that reason it seems best considered as a variety.

Cassia reducta *Brenan*, sp. nov.; *C. usambarensi* Taub. et *C. dumazianae* Brenan proxima, foliis pilis patentibus ± pubescentibus, pedicellis brevioribus differt; a *C. brevifolia* Lam. petiolis satis conspicue glandulosis facile distinguenda.

Herba ut videtur annua, a basi ramosa, caulibus tenuibus usque ad circiter 10 cm. longis ut videtur prostratis pilis curvatis laxe et inconspicue unilateraliter puberulis. *Folia*: stipulae lanceolatae, 2·5–4 mm. longae, circiter 0·75 mm. latae, apice sensim acuminatae, marginibus ciliatae, 6–7-nerviae; petiolus 2–2·5 mm. longus, pulvino basali excepto haud vel vix rugosus, pilis curvatis necnon rectis patentibus circiter 0·5–0·75 mm. longis pubescens; glandula prope apicem petioli posita, sessilis, orbicularis, patelliformis, 0·25 mm. diametro; rhachis 2·5–8 mm. longus, more petioli vestitus, supra canaliculatus, haud crenato-cristatus; foliola 3–9-juga, oblonga sed prope apicem ± dilatata, 2·5–4·5 mm. longa, plerumque 0·7–1·25 mm. lata, apice obtusa vel abrupte subacuta, supra glabra, subtus more petioli laxe vestita vel tantum conspicue ciliata; costa aliquid excentrica nervos laterales prominulos ambos margines versus emittente. *Inflorescentiae* axillares, uniflorae; pedicelli 0·5–1·1 cm. longi, inconspicue puberuli. *Sepala* circiter 3 mm. longa, extra puberula. *Petala* circiter 4 mm. longa. *Ovarium* appresse pubescens. *Legumina* oblonga, leviter falcata, 1·3–1·8 cm. longa, 3–3·5 mm. lata, sparse appresse pubescentia. *Semina* matura non visa.

MADAGASCAR. Without locality or collector. *Herb. Hooker* K, holotypus. 'In graminosis prov. Emerinae', *Hilsenberg* s.n. (BM).

This is the Madagascar plant mentioned under *C. brevifolia* by Steyaert in Bull. Jard. Bot. Brux. **20**, 267 (1950).

Mlle. Dumaz-le-Grand commented on a small fragment of this sent for comparison with *C. brevifolia*: 'l'échantillon de l'*Herb. Hooker*, bien qu'il soit difficile de juger avec trop peu de matériel, me parait différent: poils beaucoup plus longs, dressés surtout sur le rachis, présence d'une glande en effet bien visible.'

Cassia dumaziana *Brenan*, sp. nov.; *C. usambarensi* Taub. proxima, stipulis latis ovatis, glandula petioli majore, caulibus unilateraliter puberulis, foliis paucijugis differt; a *C. reducta* Brenan pilis omnibus appressis, stipulis latioribus, pedicellis longioribus etc. et a *C. brevifolia* Lam. glandula satis obvia inter alia distinguenda.

Herba ut videtur perennis, a basi ramosa, caulibus prostratis simplicibus vel parum ramosis usque ad 30 cm. longis unilateraliter puberulis. *Folia*: stipulae ovatae, 5–7 mm. longae, basim versus 2–3·5 mm. latae, apice sensim acutissimae, glabra, basi circiter 7–13-nerviae; petiolus 2·5–3 mm. longus, pulvino basali excepto haud vel vix rugosus, supra puberulus, subtus subglaber; glandula prope apicem petioli posita, sessilis, orbicularis, patelliformis vel breviter cupuliformis, apice leviter concava, siccitate aurantiaco-brunnea, 0·3–0·5 mm. diametro; rhachis 3·5–13 mm. longus, more petioli vestitus, supra canaliculatus, haud crenato-cristatus; foliola 2–5-juga, ± oblique obovato-oblonga, 4·5–8·5 mm. longa, apicem versus (1·5–) 2–3·5 mm. lata, apice plerumque rotundata et perbreviter mucronata, glabra, costa aliquid excentrica nervos laterales prominulos ambos margines versus emittente. *Inflorescentiae* axillares, uniflorae vel biflorae; pedicelli floriferi 1·5–2·2 cm. longi, fructiferi usque ad 3 cm. longi, unilateraliter puberuli. *Sepala* ± lanceolata vel elliptica, 6 mm. longa, 1·5–3 mm. lata, apice acuta, extra medio leviter puberula. *Petala* circiter 6·5 mm. longa, 3–5 mm. lata. *Stamina* 10–12, 2–3 mm. longa. *Ovarium* appresse puberulum: stylus 1·5 mm. longus, glaber. *Legumina* lineari-oblonga, leviter falcata, circiter 2·8 cm. longa, 4 mm. lata, appresse pubescentia. *Semina* matura non visa.

MADAGASCAR. Centre: neighbourhood of Antsirabe, c. 1500 m., Jan. 1914. *Perrier de la Bathie* 4279 K, holotypus, P, isotypus. Same locality, 1600 m., Feb. 1914. *Perrier de la Bathie* 4798 (K, P).

Mlle. Dumaz-le-Grand commented on these: 'les échantillons . . . ne semblent également bien différents. C'est tout d'abord, à première vue, une différence de port. D'ailleurs Perrier écrit sur ses étiquettes "Plante peut-être vivace, à tiges étalées sur le sol . . . " Effectivement ici aussi, glande bien visible, folioles glabres à nervation visible mais plus fine et moins proéminente que dans le type de Lamarck, tiges et pétioles avec des poils parfois rares, rachis subglabre ou glabre, comme vous le signalez les stipules sont plus larges que dans les autres échantillons leur forme suggère assez un "fer de lance"), gousses effectivement parsemées de petits poils apprimés."

Cassia usambarensis *Taub.* in Engl., Pflanzenw. Ost-Afrikas **C**, 201 (1895); Bak.f., Leg. Trop. Afr. 640 (1930).

Chamaecrista usambarensis (Taub.) Standl. in Smithson. Misc. Coll. **68**, No. **5**, 5 (1917).

[*Cassia grantii* sensu Ghesquière in Bull. Jard. Bot. Brux. **9**, 143 (1932), pro parte, quoad syn. *Cassia usambarensis* et *Chamaecrista usambarensis*, non Oliv.]

[*C. brevifolia* sensu Steyaert in Bull. Jard. Bot. Brux. **20**, 266 (1950), pro parte, excl. cit. bibl. et specim. madagasc., non Lam.]

Kenya. Northern Frontier Province: Nyiru, 1 Jan. 1956, *Adamson* 565 (EA). Uasin Gishu District: Soy and Turbo roads, 1931, *Mrs. Brodhurst Hill* 241 *in C.M.* 3487 (EA, K). Eldoret district, June 1931, *Miss C. Harvey in C.M.* 1982 (EA) & 2440 m., *R. L. Harger s.n.* (BM). 29 km. S. of Eldoret, 26 June 1948, *Bogdan* 1808. Eldoret district, 11 June 1951, *G. R. Williams* 236 (EA, K). Elgeyo District: Elgeyo, 1931, *Mrs. Brodhurst Hill* 207 *in C.M.* 3487 [sic]. Nakuru District: Mau, 16 Nov. 1905, *G. S. Baker, Berlin No.* 106 *in C.M.* 13937 (EA). Mau Summit, 2590 m., *Miss D'Avigdon* 23 (BM). Ol-joro-Orok, Jan. 1932, *Pierce* 1663 *in C.M.* 3472 (EA, K). Eastern Mau Forest Reserve, 9 Sept. 1949, *Maas Geesteranus* 6219. Near Thomson's Falls, Ward's Farm, 25 June 1950, *Lacey s.n.* Naivasha District: Kinangop, Sussex Farm, 2590 m., 1 Nov. 1934, *G. Taylor* 1580 (BM):—prostrate, sepals red; petals yellow. Kinangop, Apr. 1938, *Chandler* 2330. District uncertain: Leikipia Plateau and Aberdare Range, 1908, *Scoresby Routledge s.n.* Elgon, Oct.–Nov. 1930, *Lugard* 255A. North Nyeri District: Nanyuki, *Mr. & Mrs. Moreau in E.A.H.* 11297 (EA). Kiambu District: Limuru, Dec. 1927, *Lyne Watt* 1187.

Tanganyika. Mbulu District: Mbulu, Jan. 1935, *Mr. & Mrs. Moreau* 23 (EA). Lushoto District: Masumbai–Msinga, 19 Aug. 1909, *Braun* 2763 (EA). Monolo, Jan. 1933, *Mr. & Mrs. Moreau* 29 (EA, K). Mtai–Malindi road, near Kidolgwai, 19 May 1953, *Drummond & Hemsley* 2653.

C. usambarensis is a perennial herb whose prostrate branches radiating from a thickened rootstock tend to form a carpet on the ground. It grows at rather high elevations, between 1800 and 2530 m. Unfortunately the holotype upon which the species was based, *Holst* 140 from the Usambara Mountains in Tanganyika, was destroyed and so far no duplicate of it has been traced, although there is a rough sketch of it in the herbarium of the British Museum (Natural History). The species has therefore to be interpreted from the description, which however leaves no reasonable doubt about its identity.

Cassia ghesquiereana *Brenan*, sp. nov.; inter greges specierum sub nominibus *C. mimosoides* L. et *C. kirkii* Oliv. coactis medium tenens; ab illis rhachide foliorum supra canaliculato nec crenato-cristato vel denticulato distincta, inter has forsan *C. quarrei* (Ghesq.) Steyaert proxima, sed habitu perenni, caulibus pilis longioribus patentibus necnon brevibus indutis, petalis et seminibus minoribus differt.

Herba perennis, prostrata, caulibus e caudice incrassata radiantibus, ipsis inferne lignescentibus usque ad 12–[–40] cm. longis puberulis vel breviter pubescentibus necnon pilis longioribus patentibus indutis. *Folia*: stipulae lanceolatae, 4–5[–8] mm. longae, 1·25–1·5 mm. latae, apice sensim acuminatae, marginibus breviter ciliatae, 6–8[–11]-nerviae; petiolus 1·5–2·5 mm. longus, breviter pubescens; glandula apice vel prope apicem petioli posita, sessilis, orbicularis [vel elliptica], supra applanata vel convexa, 0·25–0·4[–1·0] mm. longa, 0·25–0·4[–0·6] mm. lata, siccitate brunnea vel atropurpurea sed vivo flavescens dicta; rhachis circiter 1·1–2[–4] cm. longus, pilis longiusculis pubescens, supra canaliculatus, haud crenato-cristatus; foliola 6–17[–28]-juga, oblique oblonga, 2·5–5[–8] mm. longa, 0·5–1[–1·5] mm. lata, apice acuta et mucronata, supra glabra, subtus

glabra vel pilis paucis induta, margine ciliata: costa aliquid excentrica, nervis lateralibus subtus prominulis sed his ad marginem anticum adversis obscuris vel nullis. *Inflorescentiae* axillares [vel supra-axillares], 1–2-florae; pedicelli 0·9–1·3[–1·5] cm. longi, ut caules vestiti sed pilis patentibus saepius numerosioribus. *Sepala* lanceolata vel ovata, 5 mm. longa, 1–2·25 mm. lata, acuta, extra pubescentia. *Petala* pallide lutea, obovata, 6·5 mm. longa, 3·5–4 mm. lata. *Stamina* 9; antherae 1·25–2·5 mm. longae; filamenta 1 mm. longa. *Ovarium* dense pubescens, stylo 1·5 mm. longo glabro. *Legumina* linearia vel lineari-oblonga, 2–3·5[–3·8] cm. longa, 3·5[–4] mm. lata, extra pilis curvatis sed haud appressis pubescentia, 11–15[–20]-sperma. *Semina* brunnea, plus minusve rhomboidea, 2[–2·5] mm. longa, 1[–1·5] mm. lata, exareolata.

Belgian Congo. From Kabgaye to Mt. Njakolonge, 2100–2400 m., 1928, *Scaetta* 601 (BR).

Uganda. Kigezi District: Kachwekano Farm, 2190 m., Apr. 1949, *Purseglove* 2748 (EA, K):—prostrate legume, occasional in temporary grassland, flowers yellow: vernacular name (Luhiga) 'entahutara'. Mt. Mgahinga, mountain grassland, 2590 m., June 1951, *Purseglove* 3703 (EA, isotypus, K, holotypus):—procumbent, woody perennial; flowers pale yellow.

Tanganyika. Mbeya Airfield, in induced grassland, 1650 m., 11 May 1956, *Milne-Redhead & Taylor* 10050:—perennial with prostrate dark purplish stems; leaves green above, glaucous beneath; gland on rhachis large, yellowish, cushion-shaped; fruits green with red margin, becoming brown when ripe. Njombe, occasional in hillside grassland, 1830 m., Oct. 1931, *Staples* 170 (EA):—small bushy herb with bright yellow flowers.

This species is dedicated to J. Ghesquière, in recognition of the importance and value of his critical work on this most difficult section of *Cassia*. In his paper in Bull. Jard. Bot. Brux. **9**, 164 (1932), *Scaetta* 601 was included under *Cassia capensis* Thunb. var. *humifusa* Ghesq., together with other specimens which are not conspecific; nor can I accept the view that there is any close relationship with *C. capensis*, which has much larger flowers on much longer peduncles. *Scaetta* 601 was subsequently determined as *C. mimosoides* L. by Steyaert, and, although not actually cited in the Flore du Congo Belge **3**, was presumably included in the concept of that species, although differing in the non-crenate-crested leaf-rhachis.

It is not certain that the Tanganyika specimens cited above are identical with the Uganda and Belgian Congo ones. The material is still insufficient, the Mbeya specimen being in fruit only, and the Njombe one poor. The Uganda and Congo specimens have a small circular petiolar gland 0·2–0·5 mm. in diameter, while the others have a rather larger and more elliptic gland 0·5–1 mm. long, and 0·5–0·6 mm. wide. The seeds of the Mbeya specimen are also slightly larger (2·5 × 1·5 mm., as against 2 × 1 mm.), and sometimes the leaflets are also.

Cassia polytricha *Brenan*, sp. nov.; *C. plumosae* (E. Mey.) Vog. forsan proxima, indumento denso longiore patenti distinguenda; a *C. biensi* (Steyaert) Mendonça et Torre, cui minus affinis est, indumento longiore, foliolis numerosioribus, glandula in petiolo sessili differt. A *C. mimosoidi* L. rhachide foliorum supra haud vel vix crenato-cristata distat, et a formis fere omnibus [sed vide infra] ejus speciei pervariabilis indumento denso patenti caulis distincta.

[*Herba* annua, caule simplici vel ramoso], vel perennis caudice lignosos incrassata et caulibus simplicibus vel parum ramosis plus minusve caespitosi-

erectis vel ascendentibus usque ad 40[–100] cm. altis; caules pilis rectis patentibus circiter [0·25–] 1–1·5 mm. longis dense vestiti. *Folia* oblongo-lanceolata, apicem versus sensim angustata, [2–]2·5–4·6[–6] cm. longa, 0·6–1·7 cm. lata; stipulae lineari-lanceolatae, [(4·5–)]7–16 mm. longae, prope basim 0·75–1·75 mm. latae, apice sensim caudato-attenuatae, marginibus ciliatae et pilis paucis [vel multis] in superficie extra etiam indutae, basi 5–12-nerviae; petiolus circiter 2–3·5 mm. longus, more caulis indutus; glandula apice petioli posita, sessilis, orbicularis vel late elliptica, supra applanata, 0·5–0·75 mm. longa et lata; rhachis more petioli vestitus, supra canaliculatus, haud vel vix crenato-cristatus, eglandulosus; foliola circiter 27–52[–59]-juga [(in foliis caulinis infimis nonnunquam pauca, usque ad 10–18-juga)], oblique lineari-oblonga, (2·5–)3·5–8[–10] mm. longa, 0·5–1·2[–1·5] mm. lata, apice acuta cacumine ipso ad apicem folii adverso [in var. *pauciflora* apice nonnunquam subacuta et mucronata], basi obliqua latere proximo auriculato latere distali recto, marginibus pilis plus minusve patentibus 0·25–0·75 mm. longis ciliata aliter glabra vel subglabra; costa valde excentrica, intra 0·25 mm. a margine antico percurrens, nervis lateralibus 3–4 basalibus et 1–3 a costa supra basim ad marginem posticum adversis, sed ad marginem anticum nullis. *Inflorescentiae* axillares vel breviter supra-axillares, 1–4-florae; pedunculus brevissimus, usque ad circiter 3 mm. longus, vel subnullus; bracteae lineari-lanceolatae, stipulis similes sed minorae, [4–]5–7 mm. longae, prope basim circiter 1 mm. latae, 3–5-nerviae; pedicelli 10–17[–25] mm. longi, pilis ascendentibus vel patentibus haud appressis dense pubescentes; bracteolae 2–4 mm. longae. *Sepala* exteriora lanceolata, interiora ovato-lanceolata, [5·5–]7–10 mm. longa, 1·5–3·5 mm. lata, apice acute acuminata, extra patenter pubescentia. *Petala* lutea, obovata, 5–13 mm. longa, [3·5–]5–9 mm. lata. *Stamina* 10; antherae 3·5–7 mm. longae, filamentis circiter 1 mm. longis. *Ovarium* appresse pubescens, stylo 2·5[–4] mm. longo imo basi excepto glabro. [*Legumina* linearia, 3·2–6 cm. longa, 4·5–5 mm. lata, patenter pubescentia. *Semina* brunnea, plus minusve rhomboidea, 2·5–3 mm. longa, 1·5(–1·75) mm. lata, exareolata.]

var. **polytricha**

Perennis. Inflorescentiae plerumque 2-florae vel ultra. Petala 8–13 mm. longa.

Tanganyika. Songea District: about 29 km. ENE. of Songea by road to Hanga Farm, in *Brachystegia-Uapaca* woodland on red loam, 1050 m., 26 Mar. 1956, *Milne-Redhead & Taylor* 9402 (K, holotypus speciei):—perennial with woody rootstock and several erect pale green stems to 4 dm.; leaves green above, glaucous beneath; stipules green, adpressed to stem; calyx yellowish-green tinged orange; petals yellow; ovary reddish; stigma green; anthers yellow, becoming brown. Tunduru District: Nampungu Baraza, Mpangaduka, in miombo on sandy soil, 16 Apr. 1950, *Tanner* 125 (EA). Without precise locality, but probably either Mafia Is. or Kilwa [Nov.-Dec. 1900), *Busse* 447 (EA). Near Masasi, 22 Apr. 1935, *Schlieben* 6362 (BM):—shrubby, 1 m. high.

Portuguese East Africa. Niassa: Lichinga Plateau, 13° 35′S., 35° 20′E., very common in cultivated ground on clay soil in 'forêt xérophyte', 1300 m., Dec. 1932, *Gomes e Sousa* 1076. Same locality, common, Dec. 1932, *Gomes e Sousa* 1090. Massangulo, 13° 55′ S., 35° 35′ E., very common in old cultivations on clay soil in 'forêt xérophyte', 1100 m., Mar. 1933, *Gomes e Sousa* 1339:—flowers yellow. ? Niassa: near Lake Nyasa, 1902, *Archdeacon W. P. Johnson* 444.

Nyasaland. Southern Province: 'Zomba and East-end of Lake Shirwa', Oct. 1861, *Meller s.n.* Between Lake Shirwa and Lake Chiuta, and to the W. of Lake Chiuta, Oct. 1898, *Cunningham* 14. Zomba, 885 m., Nov. 1900, *Purves* 22. Footpath from Zomba to Zomba Plateau, 1070–1520 m., 28 Dec. 1936, *Lawrence* 231:—straggling upright plant 75–90 cm. high, with thick deep roots; flowers yellow. Zomba, 730 m., 30 Nov. 1937, *Lawrence* 606:—38 cm. high, flowers yellow. Without exact locality, *Buchanan* 1290 (BM).

var. **pulchella** *Brenan*, var. nov.

Annua. Inflorescentiae plerumque 2–(–3-) florae. Petala 5–7(–8) mm. longa.

TANGANYIKA. Songea District: Songea, in induced grassland near District Office, 1080 m., 16 Mar. 1956, *Milne-Redhead & Taylor* 9218:—(K, holotypus varietatis):—annual; stems pale yellowish-green, decumbent and ascending to 0·5 m.; leaves green above, paler beneath, with yellowish rhachis; pedicels reddish; petals pale yellow; ovary yellow with silvery hairs; stigma white; anthers 5 reddish, 5 yellow. Near Kitai, 18 May 1956, *Milne-Redhead & Taylor s.n.*

SOUTHERN RHODESIA. Inyumquarare Valley, Feb. 1935, *Gilliland* 1588 (BM). [Determination doubtful.]

var. **pauciflora** *Brenan*, var. nov.

Annua. Inflorescentiae plerumque uniflorae. Petala 6–9 mm. longa.

TANGANYIKA. Rungwe District: Masoko, 25 Sept. 1932, *Geilinger* 2632. Songea District: by Kimarampaka stream about 12 km. W. of Songea, in shallow boggy soil overlying laterite by streamside, 960 m., 5 Feb. 1956, *Milne-Redhead & Taylor* 8488 (K, holotypus varietatis):—annual, erect, simple or branched from the base; leaves dark or pale green above, paler beneath; pedicels reddish; calyx yellow tinged reddish; style and stigma yellowish-green; 2 anthers reddish and rest yellow; young fruits green, ripe fruits brown. ? District: Wame, 30 May 1922, *Swynnerton* 194 (BM) [determination, as to the variety, doubtful.]

NYASALAND. Southern Province: Makwapala, in woodland planted with *Cedrela* and blue gum, 720 m., 17 Mar. 1937, *Lawrence* 330:—12·5–31 cm. high; flowers yellow.

NORTHERN RHODESIA. Eastern Province: near Fort Young, Sept. 1896, *J. G. Nicholson s.n.* pro parte.

Like *C. ghesquiereana* Brenan, *C. polytricha* also to some extent combines in one plant features otherwise usually characteristic of the groups of species united under the names *C. mimosoides* L. and *C. kirkii* Oliv. In general facies, *C. polytricha* resembles *C. mimosoides* but differs in having the leaf-rhachis not or hardly crenate-crested above, and from nearly all forms of *C. mimosoides* in the dense spreading indumentum covering the stems. This feature is not entirely unknown in *C. mimosoides*, but is certainly rare. Other distinctive features of *C. polytricha* are the prominent venation on the lower surface of the leaflets, the comparatively long-ciliate leaflet-margins, and (as far as var. *polytricha* is concerned) the perennial thickened woody rootstock from which stems arise annually.

The closest affinity of *C. polytricha* is perhaps with *C. plumosa* (E. Mey.) Vog., which however has an appressed puberulous indumentum.

Cassia paralias *Brenan*, sp. nov., ob rhachem folii supra manifeste alato-crenatum cum *C. mimosoidi* L. comparanda, caulibus lignosis ramosissimis, stipulis siccitate saltem nigricantibus vel atrobrunneis supra basim dilatatam saepe subenerviam abrupte angustato-acuminatis, foliolis crassis imbricatis, floribus magnis differt.

Frutex 40–50 cm. altus, caulibus valde ramosis manifeste lignescentibus juventute omnino dense et appresse albido-pubescentibus serius griseis vel brunneo-griseis, indumento plus minusve persistenti. *Folia* oblonga vel lineari-oblonga, lateribus parallelis, [(0·8–)] 1·8–4·5 cm. longa, [0·45–] 0·5–0·75 cm. lata; stipulae [3–]4–5·5 mm. longae, supra basim dilatatam circiter 1–1·5 mm. latam saepe subenerviam abrupte angustato-acuminatae, saltem superne siccitate nigrescentes vel atrobrunneae, glabrae vel basim versus sparsissime et minutissime puberulae, nervis superne nonnunquam

prominulis; petiolus 2–2·5 mm. longus, appresse pubescens; glandula apice petioli posita, sessilis, orbicularis, supra concava, 0·25–0·4 mm. diametro; rhachis subtus more petioli vestitus, supra manifeste alato-crenatus, eglandulosus; foliola [15–]20–47-juga, plerumque oblique et anguste oblongo-elliptica, (2–)3–4 mm. longa, plerumque 0·75–1 mm. lata, crassiuscula, imbricata, apice obtusa vel rotundata, basi obliqua, marginibus sparse et minute ciliolatis exceptis glabra; costa quidpiam excentrica, cum nervis lateralibus nisi in foliolis juvenilibus utrinque non vel aegre cernendis, iis ad marginem anticum adversis perpaucis vel nullis. *Inflorescentiae* axillares vel parum supra-axillares, 1–2-florae; bracteae circiter 1·5–2 mm. longae, glabrae vel minute puberulae; pedicelli [1–]1·6–2·5 cm. longi, appresse pubescentes; bracteolae 1·5 mm. longae. *Sepala* exteriora anguste ovata vel lanceolata, 9 mm. longa, 3·5–4·5 mm. lata, apice acuta, extra pilis flavescentibus appresse pubescentes; interiora concavo-convexa, explicata elliptica vel ovato-elliptica, 9 mm. longa, 3·5–4·5 mm. lata, apice obtusa, hyalino-marginata, tantum inferne medio extra puberula. *Petala* lutea, obovata vel obovato-elliptica, 11–12 mm. longa, 6·5–8 mm. lata. *Stamina* 10, filamentis 1 mm. longis, antheris 4 majusculis 6 mm. longis, 6 paulum minoribus 4–5 mm. longis. *Ovarium* appresse puberulum, circiter 6 mm. longum, 1 mm. latum, stylo imo basi excepto glabro circiter 5 mm. longo. *Legumina* 3·5 cm. vel ultra longa, 5 mm. lata, appresse puberula; matura necnon semina desiderantur.

Portuguese East Africa. Sul do Save: Poméne, 22° 55′S., 35° 35′E., in sandy soil near the sea, frequent, 20 m., Dec. 1935, *Gomes e Sousa* 1691 (K, holotypus):—shrub 40–50 cm. high; flowers yellow. Bazaruto's Island, N. extremity, near lighthouse, 21° 30′S., 35° 30′E., common in sandy dry soil in treeless places, 100 m., Aug. 1937, *Gomes e Sousa* 1967:—a very short shrub; yellow flowers. Same locality, habitat and date, 50 m., *Gomes e Sousa* 1980:—short shrub, yellow flowers.

A rather similar, perhaps conspecific plant has been collected also in Portuguese East Africa:—Niassa: Quinga, old dunes, 25 July 1948, *Pedro & Pedrogão* 4644 (EA):—yellow flowers. The stems of this specimen are glabrous even when young.

Humboldt's Essay on plant-geography.*—In the year of the centenary of Humboldt's death it was good to publish a facsimile of his famous 'Essai sur la Géographie des Plantes' which he first gave as a lecture before the Institut de France on January 7th, 1805, on his return from South America. This was perhaps the first published work on plant geography, a subject which had fascinated Humboldt from his earliest youth (as long ago as 1790 he had communicated a first outline of plant geography to George Forster, the companion of Captain Cook). The short 'Essai', which was not printed before 1806, is remarkable for the breadth of view, simple language, and charming sensibilities of this very great man, who had been profoundly influenced by the wonders of tropical vegetation.

N. Y. Sandwith

* *Essai sur la Géographie des Plantes* (1807). By Alexander von Humboldt. Sherborn Fund Facsimile No. 1. Pp. xii + 38, one portrait. London: Society for the Bibliography of Natural History, 1959. Price 10/-.

The genus *Craibia*

J. B. Gillett

Although specimens of the plant here treated as *Craibia zimmermannii* were collected as early as 1822 by Forbes at Delagoa Bay, the genus was not described till 1911, when Harms & Dunn (Journ. Bot. **49**, 106) named it in honour of W. G. Craib, at that time Assistant for India at Kew, later Professor of Botany at Aberdeen. The species placed in the new genus had previously been assigned to *Dalbergia*, *Lonchocarpus*, *Millettia*, *Pterocarpus*, *Schefflerodendron* and, in MS., *Pongamia*. Since 1911 *Craibia* has been maintained by all students of Tropical African plants, though the only botanist who has studied the Tropical African *Leguminosae* as a whole, E. G. Baker (1929) writes 'The affinities of this genus are with *Milletia*, from which it is doubtfully distinguished by its alternate-pinnate or unifoliolate leaves; with *Schefflerodendron*, which is separated by its leaflets glandular below; and with *Lonchocarpus*, which has different pods.' Other botanists have merely repeated E. G. Baker's distinction, without adducing further reasons for keeping up *Craibia* as a genus, in spite of the fact that in some Papilionaceous genera, such as *Dalbergia*, alternate or opposite leaflets are found haphazardly among the species, while in others, such as *Indigofera*, this character is regarded as of merely sectional or subsectional value. Furthermore *Millettia psilopetala* Harms often has subalternate leaflets and on this account was described in 1925 by De Wildeman as *Craibia bequaertii*, both names being kept up by E. G. Baker. It therefore seems necessary to examine the differences between *Craibia* and *Millettia* more closely.

The following characters seem to be of some value:—

	Craibia	*Millettia*
(1)	Erect trees or shrubs.	Often lianes.
(2)	Hairs golden, brown or black, never white or silvery.	Hairs various, sometimes white or silvery.
(3)	Buds conspicuous, flattened, elliptical oval or orbicular with broad blunt scales.	Buds various.
(4)	Leaflets alternate or, rarely, opposite, especially in 3-foliolate leaves; or leaves 1-foliolate.	Leaflets opposite, rarely subalternate.
(5)	Inflorescence usually a true raceme, sometimes a panicle, never a false raceme with the side branches much reduced.	Inflorescence sometimes a panicle, usually a false raceme, never a true raceme.
(6)	Petals glabrous (rarely a few weak hairs at the margin only).	Standard sometimes glabrous, more often silky.
(7)	Disc absent.	Disc present or absent.

	Craibia	*Millettia*
(8)	Ovary glabrous or with long more or less caducous hairs.	Ovary never glabrous, the indumentum dense, short or long, more or less persistent.
(9)	Ovules 2–6.	Ovules often more than 6.
(10)	Ovules and seeds tending to be at or beyond the centre of the ovary or pod, the lower part of which is vacant.	Ovules and seeds distributed more or less evenly throughout the ovary or pod.
(11)	Pod tapering to the base.	Pod usually more or less oblong.
(12)	Seeds 1–2, rarely 3.	Seed often more than 3.

Of these characters only No. 10 has, so far, proved to be free from exception, though it has not been possible to examine the ovaries of all the numerous species of *Millettia*. However although, with this possible exception, there is no character of *Craibia* which does not occur in at least one species of *Millettia*, when the characters are taken together it is found that there is no species of *Millettia* which does not differ from all species of *Craibia* in at least three of these characters. Thus *M. psilopetala* the exception for character (4) is often a liane, has small inconspicuous buds with narrow, pointed scales, a 10-lobed disc, about 9 ovules evenly spaced through an ovary which bears a dense persistent short indumentum, and a turgid more or less oblong fruit. *M. lacus-alberti* has only 4 ovules and a fruit shaped much like that of *Craibia* but it is a liane with opposite leaflets silvery beneath, a 10-lobed disc and an ovary not empty at the base. Thus if reliance is placed, not on a single character, but on a group of associated characters the justification for the retention of *Craibia* is clear. A further practical reason for welcoming this view is that, were the description of *Millettia* to be widened to include the species of *Craibia* with true racemes, it would prove difficult to exclude *Wistaria* from *Millettia*.

The species of *Craibia* are rather conspicuous with their copious, fragrant, rather large, pink or white flowers. It is therefore fairly certain that they do not often escape detection in any reasonably well collected area and that the genus is in fact, as the specimens suggest, confined over most of its range to a number of isolated, presumably relict, localities. Further evidence suggests that it is, at least in some areas, becoming rarer. Thus, for instance, of 6 gatherings of *Craibia* from Nyasaland which are represented at Kew, one only was collected since 1910 although the country has naturally been more visited by collectors since that date than before.

A disjunct distribution is often a sign of antiquity, especially when the seeds, as in *Craibia*, seem ill-suited to dispersal over great distances. However, the apparent absence of *Craibia* from Madagascar makes this hypothesis unlikely. An alternative explanation is that the genus as a whole seems badly suited to resist fire; its decline would then be due to the great increase in the frequency of fires since Man learned how to use fire in Africa perhaps 40,000 years ago.

Perhaps as a result of this suggested history the species of *Craibia* present a good deal of taxonomic difficulty, the isolated populations into which they

have been divided begining to show signs of a differentiation, which is often not sufficient to warrant taxonomic recognition. Too many species have been described and the only attempt to deal with the whole genus after Dunn's original account in 1911, that by E. G. Baker (1929), completely fails as a means of identification. In 1954 a great part of the difficulty was removed by Prof. Hauman's splendid account of the Congo species and the present paper is an attempt to extend this to cover the genus as a whole.

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Key to the species and subspecies

Leaves 1-foliolate; inflorescence paniculate; bracteoles below middle of pedicel . . . . . 1. *C. simplex*

Leaves 3- or more-foliolate:

Inflorescences all clearly paniculate (axes repeatedly branched); ovary glabrous:

Calyx and pedicels glabrescent; corolla 2 cm. or more, filament-sheath 12–15 mm. long; pedicels of mature flowers 1 cm. or more long:

Bracteoles at or below middle of pedicel; auricles of wing and keel under 2 mm. long . . . . . 2. *C. lujai*

Bracteoles at base of calyx; auricles of wing and keel 3 mm. or more long . . . . . 3. *C. macrantha*

Calyx and pedicels with a dense short appressed brown indumentum; corolla up to 13 mm., filament-sheath 6–8 mm. long; pedicels under 6 mm. long; bracteoles at calyx-base . . . . 4. *C. laurentii*

Inflorescences racemose (rarely the axis once branched), occasionally falsely appearing paniculate when crowded together and the subtending leaves fallen; bracteoles at or near calyx-base; fruiting pedicels over 6 mm. long:

Ovary glabrous, or with the base and sutures only pubescent:

Pedicels and calyx glabrous or nearly so; hairs on inflorescence-axis rather sparse and mostly over 0·5 mm. long; bracteoles linear or spathulate, up to 3 mm. long and c. 0·5 mm. wide at the base; leaflets 3–5; filament-sheath 10–11 mm. long 5. *C. zimmermannii*

Pedicels, calyx and inflorescence-axis densely pubescent, the hairs on the latter under 0·5 mm. long; bracteoles at least 1 mm. wide:

Leaflets 5–9, thrice as long as wide; bracteoles obovate or oblong, up to 6 mm. long; corolla 20–25 mm., filament-sheath 13–15 mm. long . . . . . 6. *C. affinis*

Leaflets usually less than three times as long as wide; bracteoles orbicular or ovate, under 4 mm. long; corolla 12–18 mm., filament-sheath 8–12 mm. long:

Distal ascending part of ventral margin of keel as long as, or longer than the proximal horizontal part below the bend . . . . . 8. *C. atlantica*

Distal ascending part of ventral margin of keel shorter than the proximal horizontal part below the bend . . . . . 7. *C. brevicaudata*

Leaflets 3–5; filament sheath 8–10 mm., corolla 12–15 mm. long; bracteoles very caducous, suborbicular, rarely exceeding 1·5 mm. long . . . α subsp. *brevicaudata*

Leaflets 3–7(–9); filament sheath 10–12 mm. long; bracteoles more persistent:

Bracteoles oval, c. 2 mm. long; indumentum of inflorescence golden brown rather than black; ovary sparsely pilose on sutures and at base . β subsp. *baptistarum*

Bracteoles oval, c. 3 mm. long:

Indumentum of inflorescence golden brown; ovary sparsely pilose at base and on sutures . . . . . γ subsp. *burtii*

Indumentum of inflorescence blackish, ovary more densely pilose at base and on sutures . . . . . δ subsp. *schliebenii*

Ovary tomentose all over, both on the sides and at the sutures:

Leaf-rhachis glabrous, or with a few scattered hairs, rarely twice as long as inflorescence; leaflets 3–7, glabrous or nearly so:

Bracteoles orbicular, less than ½ as long as calyx; inflorescence-axis slender, usually under 2 mm. in diameter; corolla under 18, filament-sheath under 9 mm. long . . . 8. *C. atlantica*

Bracteoles oblong, about half as long as calyx; inflorescence-axis stout, usually over 2·5 mm. in diameter; corolla c. 20 mm., filament-sheath c. 13 mm. long . . . . 9. *C. brownii*

Leaf-rhachis pubescent, usually at least twice as long as the subtended inflorescence; leaflets 5–9, their undersides pubescent, bracteoles oblong, more than half as long as calyx; corolla over 2 cm. long 10. *C. grandiflora*

Enumeration of species

1. **C. simplex** *Dunn* in Journ. Bot. **49**, 107 (1911); Pellegrin, Leg. Gabon 238 (1949); Fl. W. Trop. Afr., ed. 2, **1**, 527 (1958)

S. Nigeria. Calabar, *W. G. Milne* s.n., BM, holotype.
Gabon. *Le Testu* 1803*, 1806, BM.

Note: the flower dissected showed 2 free stamens and 8 connate; the number of ovules (6) was the highest found in the genus.

2. **C. lujai** *De Wild.* in Bull. Jard. Bot. Brux. **7**, 269 (1920); Fl. Congo Belge **5**, 56 (1954)

C. lujai var. *longeacuminata* De Wild., *l.c.* 270 (1920)

Belgian Congo. Kasai Province, (*Luja* s.n., BR, holotype), *Gillardin* 311*, 330, *Claessens* 355.

3. **C. macrantha** (*Pellegr.*) *Gillett*, stat. nov.

C. filipes var. *macrantha* Pellegr., Leg. Gabon 239 (1949)

C. lujai affinis; foliolis paucioribus, bracteolis ad basin calycis ortis, persistentioribus, dentibus calycis minoribus et auriculis alae carinaeque majoribus differt.

Arbor, ramulis albo-griseis glabris. *Folia* glabra; rhachis ad 4 cm. longa; stipulae mox caducae, haud visae; foliola 1–4, elliptica, acuminata, ad 7 cm. lata et 13 cm. longa, nervis principalibus utrinque c. 5. Flores in *paniculis* terminalibus minute sparseque appresse aureo-pubescentibus, rarius quoque in racemis paucis axillaribus dispositi. *Bracteae* caducae, haud visae. *Pedicelli* ad 13 mm. longi. Bracteolae oblongae vel oblanceolatae, ad basin calycis ortae, fere ad anthesin persistentes, apice pubescentes, ad 1·6 mm. longae et 0·8 mm. latae. *Calyx* fere glaber, late turbinatus, tubo c. 6 mm. longo, dentibus fere obsoletis, ad 1 mm. longis. *Vexillum* 3 mm. unguiculatum, lamina oblonga, emarginata, 14 mm. lata, 17 mm. longa. *Alae* 7 mm. unguiculatae, 4 mm. auriculatae, lamina fere recta 6 mm. lata, 17 mm. longa. *Carinae* margo inferior in toto 30 mm. longus, ungue 9 mm. longo incluso, medio per 80° curvatus; auriculum 4 mm. longum. *Filamentum* liberum versus basin valde curvatum; filamentorum aliorum pars connata 14–17 mm. longa, partes liberae 4–8 mm. longae. *Antherae* c. 0·7 mm. longae. *Ovarium* 5-ovulatum, glabrum, 13 mm. longum, stylo gradatim curvato, 8 mm. longo. *Legumen* haud visum.

GABON. Lastoursville District, Koulamotou, *Le Testu* 7992*, BM, FHO, K, (P, holotype).

This plant with its larger, fewer, leaflets; its freedom from long dark hairs; its very caducous stipules, paniculate inflorescence and much larger flowers is certainly specifically distinct from the geographically and ecologically remote *C. zimmermannii* (*C. filipes*). It is much more closely related to *C. lujai*.

4. **C. laurentii** (*De Wild.*) *De Wild.* in Bull. Jard. Bot. Brux. **7**, 268 (1920); Eggeling & Dale, Indig. Trees Uganda, ed. 2, 299 (1952); Fl. Congo Belge **5**, 55 (1954)

Lonchocarpus laurentii De Wild., Miss. Laur. 117 (1907)

L. alternifolius Harms, nomen in herb.

Craibia utilis M. B. Moss in Kew Bull. **1929**, 195 (1929); Andrews, Fl. Pl. Sudan **2**, 178 (1952)

[*C. atlantica* sensu Pellegr., Leg. Gabon 239 (1949) p.p., quoad pl. cit., non Dunn]

FRENCH CAMEROONS. Bipinde, *Zenker* 2297 '*L. alternifolius*'.

BELGIAN CONGO. Central Forest Region, *Louis* 13866*, 15664, 16872, (*Laurent* s.n., BR, holotype).

SUDAN REPUBLIC. Lotti, 4° 0′ N., 33° 30′E., *Chipp* 12*, type of *C. utilis*, *Myers* 9579, *Andrews* 1696.

UGANDA. West Nile District, *Eggeling* 1252, *Greenway & Eggeling* 7242; Karamoja, *A. S. Thomas* 2124; *Mrs. Dyson-Hudson* 402; Bunyoro District, Budongo, *Eggeling* 4378; Teso District, *Hancock* 1973, *Michelmore* 1274; Mbale District, *Dawkins* 799.

KENYA. Mathews Range, *Bally* 3674, 4359; Mt. Nyiro, *Lady M. Jex Blake* 43; Turkana, Wakorr camp, *Champion* 209; W. Suk, Nakujit on Suam R., *Mrs. Tweedie* 76.

5. **C. zimmermannii** (*Harms*) *Harms ex Dunn* in Journ. Bot. **49**, 108 (1911)

Lonchocarpus zimmermannii Harms in Engl., Bot. Jahrb. **45**, 311 (1910)

C. filipes Dunn in Journ. Bot. **49**, 109 (1911)

TANGANYIKA. Tanga Province; Amani, Bomole, *Zimmermann* 1480* (B, holotype), EA, K, isotype; Eastern Province: Kiserawe District, Korekese Forest Reserve, *Semsei* 1394.

Portuguese E. Africa. Manica e Sofala: Zambiti 38 km. from Beira, *Sheppard* 305, type of *C. filipes*, *Dawe* 361, *Mendonça* 166, *Swynnerton* 1009; Sul do Save: *Dawe* 523*; Lorenço Marques: *Gerstner* 6622, *Shantz* 333, *Forbes* s.n., *Lindley* s.n.

Dunn (1911) states that *C. filipes* differs from the rest of the genus in having the ovary 2–3 instead of 4–6-ovulate. However, the flower of *Dawe* 523 which was dissected had 4 ovules while 3-ovulate ovaries have been found in *C. laurentii*, *C. affinis*, *C. brevicaudata*, *C. atlantica* and *C. brownii*.

It is not quite certain that *C. zimmermannii* and *C. filipes* are conspecific. The type of *C. zimmermannii* has narrower leaflets rather less developed calyx-lobes, a more concave upper margin of the keel, still more caducous bracteoles, less indumentum and 5 instead of 2–4 ovules. It seems however unwise to make much of these differences unless they are confirmed in a greater array of specimens. *Semsei* 1394, which is in fruit, agrees in its broad leaflets with the material from Portuguese East Africa rather than with *Zimmermann* 1480.

6. **C. affinis** (*De Wild.*) *De Wild.* in Ann. Soc. Sci. Brux. **38**, 15 (1914); Fl. Congo Belge **5**, 52 (1954)

Lonchocarpus affinis De Wild. in Ann. Mus. Cong. Belge, Bot. Ser. 4, **1**, 196 (1903)
L. dubius De Wild., *l.c.* 196 (1903)
C. dubia (De Wild.) De Wild. in Bull. Jard. Bot. Brux. **7**, 268 (1920)

Belgian Congo. Haut Katanga Region: (*Verdick* 62, BR, type of *C. dubia*, *Verdick* 115, BR, holotype), *Quarré* 1913*, *Ritschard* 1731, *Hoffmann* 955, *Hutchinson* 4114.

Tanganyika. Mpanda District, Mahali Mts., *Mgaza in O.U. Tang. Exped.* 299*.

Northern Rhodesia. *White* 3251, *Fanshawe* 1547, *Milne-Redhead* 1174, .2539, 3858, *Duff* 241/37, *Holmes* 1189.

Certain forms of this species are with difficulty distinguished from *C. brevicaudata* subsp. *baptistarum*.

7. **C. brevicaudata** (*Vatke*) *Dunn* in Journ. Bot. **49**, 108 (1911)

Dalbergia brevicaudata Vatke in Oest. Bot. Zeit. **28**, 264 (1878)
Lonchocarpus brevicaudata (Vatke) Harms in Engl., Bot. Jahrb. **45**, 312 (1910)

α subsp. **brevicaudata**

Lonchocarpus deguelioïdes Harms in Engl., Bot. Jahrb. **26**, 300 (1899)

Kenya. Central Province: nr. Kibwezi, *Scheffler* 521, *Dümmer* 5099, *Bally* 8255; Coastal Province: Mombasa, *Hildebrandt* 1933 (B, holo.), BM, K, isotypes (the K sheet '1833' in error) of both *D. brevicaudata* and *L. deguelioïdes*, *Wakefield* s.n.*, *Battiscombe* 466*, *Verdcourt* 1076, *Swynnerton* 262.

Tanganyika. Tanga Province: *Greenway* 4026*, 4242, 4601.

β subsp. **baptistarum** (*Büttn.*) *Gillett*, stat. nov.

Millettia baptistarum Büttn. in Verhand. Bot. Ver. Brand. **32**, 50 (1890)
Lonchocarpus crassifolius Harms in Engl., Bot. Jahrb. **26**, 299 (1899)
L. wentzelianus Harms in Engl., Bot. Jahrb. **30**, 330 (1901)
Schefflerodendron gazense Bak. f. in Journ. Linn. Soc. Bot. **40**, 55 (1911)
Craibia baptistarum (Büttn.) Dunn in Journ. Bot. **49**, 109 (1911)

C. crassifolia (Harms) Dunn, *l.c.*

C. wentzeliana (Harms) Harms in Mildbraed, Wiss. Ergeb. Deutsch Zentr. Afr. Exped., 1907–8, **2**: 257 (1911)

C. gazensis (Bak. f.) Bak. f., Leg. Trop. Afr. 248 (1929)

Belgian Congo. Bas Congo region: near Ango-Ango (*Büttner* s.n., B†).

Tanganyika. Mbeya District: Umalila, *Goetze* 1350*, BR, isotype of *L. wentzelianus*; Njombe District: *Wigg* 4, FHO; Songea District: Matengo Hills, *Semsei* 2551, 2565, 2578.

Nyasaland. Southern Province: *Buchanan* 101*, 622 (B, syn.†) BM, K, isosyntypes of *L. crassifolius*, *Cameron* 156, *Meller* s.n., *Sharpe* 39, *Clements* 746.

Southern Rhodesia. Umtali District: *Wild* 1586*, 1587; Melsetter District: *Miss Steadman in Eyles Herb.* 5120, *Plowes* 1218; Chirinda District: Chirinda forest, *Swynnerton* 13 BM, K, type of *S. gazense*, *Armitage* 200/55, *Wild* 2213.

Northern Rhodesia. Northern Province: *Fanshawe* 3958, *White* 3695, *Trapnell* 1785, 2079, *Burtt* 6005.

Angola. *Welwitsch* 1845, 1846, 1849, *Monteiro* s.n., *Gossweiler* 4620, 8299, 9254*, 9256 9756, 10973, 12610, *Büttner* 222 (B, holotype).

γ subsp. **burttii** (*Bak. f.*) *Gillett*, stat. nov.

C. burttii Bak. f., Leg. Trop. Afr. 249 (1929)

Kenya. Kibwezi, *Scheffler* 6.

Tanganyika. Central Province: near Kazi Kazi, *Burtt* 528*, BM, K, type, 3574, 4451.

δ subsp. **schliebenii** (*Harms*) *Gillett*, stat. nov.

C. schliebenii Harms in Not. Bot. Gart. Berl. **11**, 1066 (1934)

Tanganyika. Lushoto District: *Hughes* 9*, *Muze* 7, *Procter* 157, *Bancroft* 350, FHO; Morogoro District: Uluguru Mts., *Schlieben* 3192, BM, isotype, Iringa District: *Carmichael* 269*.

Portuguese E. Africa. Gorongosa Mt., *Mendonça* 2447, *Pedro* 438.

Subsp. *schliebenii* seems to occur at higher altitudes and in moister areas than subsp. *burttii*. As may be seen *C. brevicaudata* is a very variable species. It is also difficult to separate from its neighbours, *C. affinis* being approached by subsp. *baptistarum* and *C. brownii* by subsp. *burttii* and *schliebenii*.

8. **C. atlantica** *Dunn* in Journ. Bot. **49**, 108 (1911); Fl. W. Trop. Afr., ed. 2, **1**, 527 (1958); non sensu Pellegrin, Leg. Gabon 239 (1949)

Ivory Coast. *Aubréville* 1052.

Nigeria. *Foster* 19*, holotype, *Macdonald* 45*, *Meikle* 1437, *Barter* 501.

Also a variable species. The flowers of *Macdonald* 45 and *Meikle* 1437 are considerably larger than those of the type. The amount of indumentum on the ovary varies considerably and plants with less tomentose ovaries might well be confused with *C. brevicaudata*, were it not for their geographical separation. There seems however to be a definite difference in the shape of the keel. Dunn's statement that the inflorescence is paniculate seems to be a mistake based on the fact that in the type several racemes are crowded together and that some of the subtending leaves have fallen or been removed by the collector.

† Specimen no longer in existence.

9. **C. brownii** *Dunn* in Journ. Bot. **49**, 108 (1911); Battiscombe & Dale, Trees & Shrubs of Kenya 78 (1936); Eggeling & Dale, Indig. Trees of Uganda, ed. 2, 299 (1952); Fl. Congo Belge **5**, 54 (1954)

C. elliottii (*ellioti* per errore) Dunn, *l.c.*; Battiscombe & Dale, *l.c.*

Belgian Congo. Near Lake Albert, Nioka (*De Craene* 318, BR).

Uganda. Bunyoro District: Budongo forest, *Eggeling* 5258; Ankole District: Mbarara, *Eggeling* 3644; Mengo District: Mabira forest, *Brown* 440*, BM, holotype; Busoga District: Siovona hill, *G. H. S. Wood* 657.

Kenya. Rift Valley Province: NE. Mt. Elgon, *Dale* 3241, *Mrs. Tweedie* 845, *Lugard* 659. Central Province: near Nairobi, *Elliott* 161*, 348, syntypes of *C. elliottii*, *Dawson* 254, 344, *Battiscombe* 516, *Miss Napier* 1501, *Bogdan* 1598, 2513, *G. R. Williams* 445; near Kitui, *Nicholson* 68. Nyanza Province: Kakamega, *Adams* 1180, *Holyoak in For. Dept.* 2778; Kisumu, *Bally* 691; Sotik, *Dooner* s.n.; Masai Province: Emali hill, *van Someren* 110.

Tanganyika. Bukoba District: *Procter* 142; Mwanza District: *Tanner* 1055; Lushoto District: *Ross* 573, FHO, *Greenway* 6164.

Plants from the neighbourhood of Nairobi (*C. elliottii*) tend to have fewer and smaller, less oblong, leaflets and smaller inflorescences than those from the areas around Lake Victoria. However, there is an uninterrupted series between the two extremes and it has not been possible to find any basis for distinguishing infraspecific taxa which would not leave much of the material indeterminate.

10. **C. grandiflora** (*Micheli*) *Harms ex Bak. f.*, Leg. Trop. Afr. 247 (1929); Andrews, Fl. Pl. Sudan **2**, 178 (1952); Fl. Congo Belge **5**, 55, t. 3 (1954)

Pterocarpus grandiflorus Micheli in Bull. Soc. Bot. Belg. **36**(2), 65 (1897)
C. mildbraedii Harms in Mildbraed, Wiss. Ergebn. Deutsch Zentr. -Afr. Exp., 1907–8, **2**, 257, t. 29 (1911)
C. sp. No. 8. Brenan, Check-list Trees & Shrubs Tanganyika Terr. **2**, 412 (1949)

Ubangi. Yahinga region, *Le Testu* 2608.

Belgian Congo. Central Forest region: Stanley Falls (*Laurent* s.n., BR., type), *Louis* 12266*, *Germain* 810, *Toussaint* 915, *Bequaert* 689, *Lebrun* 2193, 2914; Lake Edward & Kivu region: Beni (*Mildbraed* 2441, B, type of *C. mildbraedii*).

Ruanda-Urundi. (*Michel* 3668).

Sudan Republic. Niam-Niamland, Linduku, *Schweinfurth* 3071; Mongalla, Azza Forest, *Turner* 171.

Tanganyika. Mwanza District: near Geita, *Watkins* 542, EA; Buha District: Makere, *Hornby* 1001, EA; Mpanda District: near Kabangu, *Groome* 39; Mbeya District: Niam Niam area, *Pitt* 511, FHO.

Northern Rhodesia. Kawambwa, *Fanshawe* 3628.

Excluded species

C. bequaertii De Wild., Pl. Bequaertiana **3**, 362 (1925) is a synonym for *Millettia psilopetala* Harms (1911)

Index

Synonyms are in italics; the numbers refer to the Enumeration

Craibia affinis	**6**	C. zimmermannii	**5**
C. atlantica	4, **8**		
C. baptistarum	7β	*Dalbergia brevicaudata*	7
C. bequaertii	end		
C. brevicaudata	6, **7**	*Lonchocarpus affinis*	6
C. brownii	**9**	*L. alternifolius*	4
C. burttii	7γ	*L. brevicaudatus*	7
C. crassifolia	7β	*L. crassifolius*	7β
C. dubia	6	*L. deguelioïdes*	7α
C. elliottii	9	*L. dubius*	6
C. filipes	3, 5	*L. laurentii*	4
C. gazensis	7β	*L. wentzelianus*	7β
C. grandiflora	**10**	*L. zimmermannii*	5
C. laurentii	**4**		
C. lujai	**2**, 3	*Millettia baptistarum*	7β
C. macrantha	**3**	M. psilopetala	end
C. mildbraedii	10		
C. schliebenii	7δ	*Pterocarpus grandiflorus*	10
C. simplex	**1**		
C. utilis	4	*Schefflerodendron gazense*	7β
C. wentzeliana	7β		

Ethnobotany.*—This is an interesting little book, which compresses an amazing amount of very varied information into a small space. The author takes a broad view of his subject. For instance, the chapter on 'The provision of food' includes a selection of the obvious edible plants, but also mentions flavouring substances more remotely derived from plants, such as benzaldehyde from coal-tar and smoke from oak-chips. 'Plant culture' mentions many aspects, from modern uses of chemical nutrients, seed dressings and insecticides, to ancient magical rites such as fertility murder of spring queens!

The potentialities of the world's flora, and the importance of plants or plant-products, in almost every human activity are well emphasized. Senior school and older students will find much food for thought in this book. It is unfortunate that it should be open to criticism for rather too frequent errors in botanical names. Some of its sweeping generalizations also are apt to be aggravating, especially as the absence of a bibliography makes it impossible to confirm the author's sources of information.

S. G. Harrison

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* *An Introduction to Ethnobotany*. By P. J. Faulks. Pp. vii + 152. London: Moredale Publications Ltd., 1958. Price 15/-.

Notes on banana taxonomy

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It is now over ten years since the new Banana Research Scheme was started and E. E. Cheesman summarized his researches into the taxonomy of the bananas in this journal (Kew Bull. **2**: 1947, *et. seq.*). Since that time a general treatment of the genus *Ensete* in Africa has appeared (Kew Bull. **8**, 405–16: 1953, 574: 1954) and several new species and combinations have been made in *Musa*, mostly as a result of a banana-collecting expedition made in 1954–5 (Kew Bull. **11**, 463–89: 1957). As a result, our knowledge of the genus *Musa* is now somewhat wider than it was ten years ago and it is possible also to give a general, though still incomplete, account of *Ensete* in Asia. The purpose of this paper is to describe two new species and to present brief assessments of our present knowledge of the composition of the two genera in the form of check lists.

I. TWO NEW SPECIES OF MUSA

1. **Musa ingens** *Simmonds*, sp. nov.

Planta ingens, vix stolonifera; inflorescentia pendula; infructescentia ingens et compacta, fructibus seminibusque magnis; bracteae deciduae, fragiles, multiflorae; flores basales hermaphroditi; gemma mascula subglobosa bracteis ad apicem haud imbricatis; chromosomata quattuordecim; magnitudo ingens hanc speciem a *Musis* ceteris omnibus distinguit; affinitas ignota.

Plants huge, the pseudostems 10–15 m. tall and 2 m. in girth at the base, sparsely suckering; *juice* watery; *sheaths* waxy below, tinged reddish brown above; *petioles* up to 60 cm. long, deeply channeled above with erect and slightly scarious margins; *leaves* up to 5 × 1 m.; *inflorescence* huge, pendulous, borne on a massive glabrous peduncle 10 cm. in diameter; *basal hands* very numerous (ca. 20), each bearing 16–25 hermaphrodite flowers; *hermaphrodite flowers*, the ovary 5–6 × 1·2–1·4 cm., angular, slightly tapered above and below, trilocular with biseriate ovules, the *compound tepal* 4·5 cm. long, thickened at the back angles, and surmounted by 5 deep (2 cm.) lobes, the outermost pair of major lobes bearing awn-like processes 7 mm. long, the inner lobes shortly (2 mm.) apiculate, the *free tepal* about 3 cm. long, oblong, raggedly obtuse-mucronate at the apex, hardly tapered towards the base, somewhat thickened at the back and transversely wrinkled-corrugated in the upper two thirds of its length, the *style* massive, about 4 mm. thick surmounted by an irregularly shaped but not greatly swollen stigma, the *stamens* 5, somewhat shorter than the stigma; *bracts* of the basal hands deciduous, oblong, subobtuse, ca. 34 × 18 cm., somewhat fleshy-leathery and apparently not so brittle as the male bracts; *male axis* massive, ca. 1 m. long at time of bunch maturity, with very prominent bract insertion scars; *male bud* massive, oblong to subglobose, the component bracts loosely packed and not imbricate at the tip; *male bracts* deciduous, very broadly ovate, 21 × 17 cm., rounded at the apex, shallowly dish-shaped and slightly hooded at

the tip, thin, leathery-brittle (not toughly fibrous) in texture, dull greyish-purple and shiny without, pale in colour within; *male flowers* 20–25 per bract, biseriate, each 7 cm. × 5–6 mm. overall, the *abortive ovary* 8 mm. long, the *compound tepal* 6 cm. long, strongly thickened along the two angles, deeply (4 mm.) 5 (i.e. 3 + 2)-toothed and tinged with orange-yellow at the apex, the *free tepal* 3 cm. long, oblanceolate, rounded and ragged-mucronate at the apex, tapered and slightly thickened at the back towards the base, the *stamens* 5, with anther 2·5 cm. long and filament 2 cm. long, elongating at anthesis; *fruit-bunch* massive, about 20 hands of 16–25 fruits each, very compact, estimated to weigh about 60 kg.; *mature fruits* massive, ca. 18 × 3–4 cm., largest towards the base of the bunch, tapering below into the short (2 cm.) pedicel, rounded or shortly and bluntly acuminate at the apex, devoid of floral remnants, lightly angled and somewhat flattened on the faces opposed to neighbours in development, pale in colour; *seeds* smoothly angular in outline, very variable in shape as a result of compression between neighbours, dark brown to black, ca. 7 mm. in mean diameter (4–10 mm.) with a deep (2 mm.) hilar cavity but lacking an umbo opposite the hilum; somatic *chromosome number* 2n = 14.

Specimens examined

New Guinea. Aiyura, alt. 1770 m., 22 Dec. 1954, *Womersley & Simmonds* B.E.40 (K, LAE) = I.C.T.A. Intr. 453; Morobe District, Garaina, Jan. 1955, *N.G. For. Dep.* 6954 (LAE), = I.C.T.A. Intr. 465; Morobe District, Garaina, Jan. 1955, *N.G. For. Dep.* 6956 (LAE), = I.C.T.A. Intr. 481; Morobe District, Garaina, alt. 1350 m., March 1955, *N.G. For. Dep.* 6965 (K, LAE); Morobe District, Skindewai, alt. 1620 m., 6 Jan., 1956, *Womersley & Millar in N.G. For. Dep.* 8368 (K, LAE), type = I.C.T.A. Intr. 501; Aiyura, 4 June 1957, (I.C.T.A. Intr. 510) (seeds only, the material of which the chromosomes were counted).

Remarks

The description above is based on field notes made at the collection of B.E.40, on the New Guinea Forestry Department specimens cited and on photographs by J. Womersley (now in the Kew Herbarium). The species is notable for its enormous size; it is about twice as big as the largest banana otherwise known and is surely the largest herb in existence.

Its known distribution is on high ground between 1350 m. and 1800 m. in a limited area of northern central New Guinea. At Aiyura it grew in primary montane rain-forest dominated by *Nothofagus grandis* and *Dillenia montana*—i.e. it did not appear to be ecologically a seral plant as are the other wild bananas. The species does not thrive in Trinidad, as is generally true of montane bananas; all the seedlings germinated at the I.C.T.A. have been lost before reaching the field.

The seeds of *Musa ingens* are the largest known in the genus and could very well be mistaken for those of an *Ensete*. The suckering habit (though sparse), the columnar pseudostems, tightly packed leaf-sheaths and flowers deciduous independently of the bracts show that it is a *Musa*, however. In its lax and subglobose male bud, fragile rather than fibrous bracts, large seeds, gigantic size and, above all, in chromosome number, it seems quite distinct from all other wild bananas. The chromosome number, 2n = 14, is new to the family (Shepherd in Nature **183**, 1539) and, indeed, is known only in *Strelitzia* in the whole order *Zingiberales*. It will probably prove to be best placed in a new section of the genus.

Musa gigantea Kuntze from Sumatra deserves comment in this connexion. It was described as a large non-stoloniferous plant having female basal flowers, persistent male bracts about twice as long as broad and small, pale (but probably immature or aborted) seeds, thus differing from *Musa ingens* in several important characters. Kuntze himself (Rev. Gen. Pl. **2**, 691: 1891); and see Cheesman in Kew Bull. **2**, 104: 1947) thought it belonged in *Physocaulis* (i.e. *Ensete*). The description is not good and the species must be recollected before it can be evaluated.

2. **Musa beccarii** *Simmonds*, sp. nov.

Planta parva, stolonifera; inflorescentia erecta; bracteae deciduae, coriaceae, fulgidae, pauciflorae, coccineae, apicibus viridibus; flores uniseriati, basales feminei; infructescentia laxa fructibus paucis erectis; gemma mascula gracilis, ad apicem fortiter imbricata; semen subglobosum verrucosum, umbone prominente hilo opposito; chromosomata octodecim; facies *Musam coccineam* Andrews revocat sed fructibus majoribus, bracteis deciduis, seminibus subglobosis, numeroque chromosomatarum differt; affinitas ignota.

Plants small, the pseudostems 10–15 dm. tall, freely suckering; *juice* watery; *sheaths* bright green, devoid of wax, somewhat polished, tinged with brownish-purple at the edges; *petioles* up to 35 cm. long, tightly clasping below, with erect or slightly incurved, narrowly purple and scarious margins above; *leaves* up to 100 × 30 cm., oblong-lanceolate, obtuse, the lamina halves slightly unequal and rounded or sharply cuneate at the base, bright green in colour and devoid of wax; *inflorescence* small, erect, borne on a minutely (rough-) hairy peduncle, 2 cm. in diameter; *basal hands* 2–5 in number, each bearing 1–3 uniseriate female flowers; *female flowers*, the ovary 5–6 cm. long, trilocular with ca. 170–250 biseriate ovules, the *compound tepal* 3–4 cm. long, flattened at the back and ribbed, pale yellow at the base grading to pale greenish yellow at the tip with 5 green minutely apiculate teeth, each 2 mm. long, the *free tepal* 3 cm. long, ovate-lanceolate, boat shaped, obtuse and crumpled-corrugate at the apex, translucent with yellow tinge near base, the *style* equal to the compound tepal, stout, pale yellow with dorsiventrally flattened stigma 6 × 5 mm., the *staminodes* 5, *nectar* abundant, watery rather than gelatinous; *bracts* of the basal hands deflexed but not rolled, deciduous, thinly leathery, light red with subobtuse green tips, polished without, duller within, not at all waxy; *male axis* slender, erect or slightly declining, up to 40 cm. long at time of bunch maturity, with slightly prominent bract scars about 2 cm. long and 2 mm. deep and a ribbed and finely rough-hairy surface between the scars; *male bud* spindle-shaped, broadest about the middle, rounded-acute at the apex, strongly imbricate in the distal one third of its length; *male bract* deciduous, lanceolate, obtuse, 10 × 3–4 cm., almost flat, thick and leathery in the centre, thinner near the edges, polished scarlet and greenish at the tip without, scarlet and duller within, persistent for a day after the flowers fall, deflexed at flowering and slightly recurved at the margins but not rolled back; *male flower* , 2–5 per bract, uniseriate, each 4–5 cm. long, the *abortive ovary* 6 mm. long, the *compound tepal* 3·5–4·5 cm. long, ribbed at the dorsal angles, with 5 minute, mucronate teeth 1–2 mm. long, yellowish white below shading to green at the tip, the *free tepal* 20–30 × 10–12 mm., broadest near

the base, nearly plane, tapered to a blunt mucronate point, whitish translucent near the base, tinged with green distally on the slender midrib, the *stamens* 5, 35–40 mm. long, white, with copious chalky-white pollen; *fruit-bunch* small, erect and loosely packed, consisting of 2–5 hands of 1–3 fruits each; *fruit* shortly pedicellate, erect, cylindrical, bottlenecked at the tip, 5–15 × 2 cm.; *seeds* subglobose, 4–5 mm. in diameter, light brown in colour, finely warty-ribbed with prominent pale hilar scar 3 mm. in diameter and prominent umbo 1–2 mm. high and with a small apical pit at distal end of seed; somatic *chromosome number* 2n = 18.

Specimens examined

British North Borneo. Mile 18, Labuk road, 1956, *G. H. S. Wood s.n.* (K, holotype and photograph) = I.C.T.A. Intr. 503; same locality, May 1956, *D. I. Nicholson s.n.* (K); Sapagaya For. Res., Elopura, Sandakan, 24 May 1949, *Cuadra in Br. N.B. For. Dep.* A 2288 (SING):—vernacular name 'Pisang hutan'; Kori timber camp, Kinabatangan Besar, 1 Nov. 1948, *Cuadra in Br. N.B. For. Dep.* A 2154 (SING):—vernacular name 'Pisang hutan'; Lun Manggis, Sandakan, 22 May 1950, *Agama & Kadir in Br. N.B. For. Dep.* A 2826 (K, SING); same locality, 13 June 1950, *Kadir bin Abdul in Br. N.B. For. Dep.* A 2852 (K, SING); Lung Manis, Br. B. T. Co., Elopura, Sandakan, 2 July 1949, *Cuadra in B. N. B. For. Dep.* A 2347 (SING); Elopura, mile 17, Labuk road, Sandakan, 1 June 1951, *Keith in Br. N. B. For. Dep.* A 1637 (K, SING):—vernacular name 'Pisang hutan'; Beaufort, mile 80, Halogilat, 19 May 1951, *Alenadra in Br. N. B. For. Dep.* A 3022 (K, SING); Sandakan, mile 15.5, 9 June 1933, *Puasa in Br. N. B. For. Dep.* 4912 (SING):—vernacular name 'Pisang tajak'.

Remarks

This interesting little plant recalls *Musa coccinea* Andrews in general appearance but is quite distinct from it in the deciduous basal bracts, the large green fruits, the long-lived male bud and, above all, in the seeds which are not of the barrel- or top-shaped type characteristic of sect. *Callimusa*. The chromosome number, 2n = 18, is new to the genus *Musa* (see Shepherd in Nature **183**, 1539). In the herbarium the plant looks like sect. *Rhodochlamys* and I took it to be allied to *M. laterita* E. E. Cheesm. when I first saw specimens in the Singapore collections (see Kew Bull. **11**, 484: 1957). Like *M. ingens*, it almost certainly represents a new section of the genus.

The species grows well in Trinidad (which is rather unusual for bananas from Borneo) but sets fruit only sporadically. The description above is based on living plants grown in Trinidad, except for fruit characters which are described from the Singapore specimens. So far as other characters can be determined in the herbarium, the Trinidad and Singapore plants agree well and there is no reasonable doubt that all the specimens cited represent but one species.

The species is named in honour of O. Beccari, distinguished for his contributions to the botany of Borneo and for his excellent descriptions of wild bananas from that island.

II. OTHER MUSA SPECIES OF INTEREST

This is a convenient place to summarize briefly information about several interesting members of the genus which are yet insufficiently known to be fully classified.

Musa acuminata Colla in Ceylon

I.C.T.A. Intr. 490, received in July 1955 from the Government Botanist, Ceylon, has been grown and found to be a strain of *Musa acuminata* remarkably similar to the subsp. *burmannica* Simmonds. The strain is wild in the Kiripanagala range of Ceylon where it is known by the local name Unel (Chandraratna in Ind. Journ. Genet. Pl. Br. **11**, 31: 1951). Unlike the strain of the species known from the adjacent mainland of southern India (i.e. *Musa banksii* var. *singampatti* Nayar), the basal flowers are functionally female, not hermaphrodite (cf. Nayar in Ind. Journ. Hort. **9**, 13: 1952); Simmonds in Kew Bull. **11**, 465: 1957). Whether its affinities lie with subsp. *burmannica*, as its appearance suggests, crossing experiments now in progress will show.

An undescribed species of sect. *Musa* from Sumatra

I.C.T.A. Intr. 511 received from W. Meijer in 1957 came from Mt. Sago, Halaban, Sumatra, at an altitude of 800 m. The local name, 'Pisang tjirik minjak', means 'dirty oil' and refers to the sticky, staining juice of the plant. The collector's notes refer to fruits dehiscent at maturity (a character otherwise known in the section only in *Musa schizocarpa* Simmonds); immature plants now growing at the I.C.T.A. look like sect. *Musa* (they bear a striking general resemblance to some strains of *Musa acuminata* subsp. *banksii* (F. Muell.) Simmonds) and K. Shepherd has determined their chromosome number as $2n = 22$. A striking feature of the species is the extremely small seed (ca. 3 mm.), the smallest known in the genus and matched only, in my experience, by a specimen in the Calcutta herbarium labelled: '*Musa sylvestris* Rumph Amboina ex Hort. Bogor'. I understand from Meijer that he will soon describe this interesting plant.

A probable new *Australimusa* from western New Guinea

Two collections recently received at the I.C.T.A. jointly suggest the presence of an undescribed *Australimusa* at Manokwari, western New Guinea. They are: I.C.T.A. Intr. 526, St. John 26137, sent by H. St. John in December 1957; and I.C.T.A. Intr. 528 sent by J. Barrau in March 1958. St. John's notes indicate a small plant (1–2 m. tall) with fruits reddish orange at maturity; Barrau's notes agree as to fruit colour and add the point that the sap is pinkish but his photographs suggest a somewhat larger plant than that from which I.C.T.A. Intr. 526 came. The seeds of the two collections agree very well in being pale brown and smoothly angular-subglobose with a prominent umbo opposite the hilum. In many respects the plant is reminiscent of *Musa lolodensis* E. E. Cheesm. from Halmaheira but the plumper seeds with more prominent hilum appear to be different. Study of living plants will be necessary to determine its status.

Callimusa in Borneo.

Three species of *Callimusa* have been described from Borneo: *M. borneënsis* Becc., *M. campestris* Becc. and *M. hirta* Becc. (Cheesman in Kew Bull. **2**, 112: 1947; **5**, 151: 1950); introductions to the I.C.T.A. give evidence of the occurrence of one and perhaps two other species in the island.

Cheesman, during a visit to Borneo in 1948, recognized what he took to be a new *Callimusa* at Tawau, Br. N. Borneo. This plant is represented by two

collections of R. Forster (I.C.T.A. Intr. 348, Jan. 1951; and Intr. 497, Aug. 1955 from the Kinabatangan River). The vernacular name is Pisang wongkod and the notes and photographs indicate a large plant with light yellow sap, large dense horizontal bunches and yellow male bracts. We have, unfortunately, been unable to raise plants at the I.C.T.A.

The seeds agree with those of *Musa borneënsis*, to which the plant is evidently related. No fewer than seven other introductions received at various times from different parts of Borneo all agree in seed characters and it is evident that one or both species is or are widely distributed in the island. Only one of these introductions proved to be viable and the plants turned out to be *M. borneënsis* (Intr. 278, 'Pisang awai', from southeast Borneo).

The presence of yet another *Callimusa* in Borneo is suggested by five introductions to the I.C.T.A., none of which yielded plants. The seeds are not quite uniform as to size but all are similar and all are quite distinct from those of *M. borneënsis* and its ally; they are remarkably small (4–5 × 2–3 mm.) but of the barrel-shaped type characteristic of sect. *Callimusa*. If only one species is represented then it must be widespread for three collections came from Sarawak (I.C.T.A. Intr. 117, 304 and 305 sent by the Director of Agriculture, Sarawak, under the three vernacular names: Pisang kra, Pisang tauh and Pisang putat, respectively) and two came from southeastern Borneo (Intr. 276 and 277, Pisang koekoe, Oct. 1947, sent from the Makasser Experiment Station).

The two little-known species of Beccari must be considered in this connexion, viz. *M. campestris* and *M. hirta*. Both are described as having erect inflorescences which separates them from Pisang wongkod; *M. campestris* has small seeds (6 × 2–3 mm.) which approach the small-seeded species just mentioned and this may well prove to be its identity. *M. hirta* is something of a mystery; it is described as a small plant with erect bunches, red bracts, hairy coherent fruits and angular-subglobose seeds. Though in aspect it must resemble a *Callimusa* the seeds disagree and it may be that its affinity will turn out to lie with *Musa beccarii*.

III. A CHECK-LIST OF MUSA

Since Cheesman (in Kew Bull. **2**, 108: 1947) surveyed the genus a number of new species have been described and it may be helpful to present here a check-list, with references to recent literature, of those that our present knowledge suggests are good. For remarks on the inclusion of *Musa lasiocarpa* in this list, see p. 210. The genus appears to contain between 30 and 37 species.

Section *Musa*

1. *M. acuminata* Colla (Kew Bull. **3**, 17: 1948; **11**, 463: 1957)
   - subsp. *malaccensis* (Ridl.) Simmonds
   - subsp. *siamea* Simmonds
   - subsp. *burmannica* Simmonds
   - subsp. *microcarpa* (Becc.) Simmonds
   - subsp. *banksii* (F. Muell.) Simmonds
2. *M. balbisiana* Colla (Kew Bull. **3**, 11: 1948)
3. *M. flaviflora* Simmonds (Kew Bull. **11**, 471: 1957)

4. *M. itinerans* E. E. Cheesm. (Kew Bull. **4**, 23: 1949)
5. *M. basjoo* Sieb. (Kew Bull. **3**, 323: 1949)
6. *M. schizocarpa* Simmonds (Kew Bull. **11**, 474: 1957)
7. *M. nagensium* Prain (Kew Bull. **3**, 325: 1949)
8. *M. sikkimensis* Kurz (Kew Bull. **11**, 478: 1957)
9. *M. cheesmani* Simmonds (Kew Bull. **11**, 479: 1957)
10. Undescribed species from Sumatra mentioned above.

[Remarks: *M. sumatrana* Becc. is most probably a subsp. of *M. acuminata*, as also is *M. banksii* var. *singampatti* Nayar.]

Section *Rhodochlamys* (Baker) E. E. Cheesm. in Kew Bull. **2**, 108, 110 (1947)

11. *M. ornata* Roxb. (Kew Bull. **4**, 24: 1949)
12. *M. velutina* H. Wendl. & Drude (Kew Bull. **4**, 135: 1949)
13. *M. laterita* E. E. Cheesm. (Kew Bull. **4**, 265: 1949)
14. *M. rubra* Wall. ex Kurz (Kew Bull. **4**, 265: 1949)
15. *M. sanguinea* Hook.f. (Kew Bull. **4**, 133: 1949)
16. *M. mannii* H. Wendl. ex Bak. (Kew Bull. **2**, 110: 1947)
17. *M. aurantiaca* G. Mann ex Bak. (Kew Bull. **2**, 110: 1947)

[Remarks: *M. dasycarpa* Kurz is probably *M. velutina* over which it has priority as a name (Kew Bull. **4**, 135: 1949); the last two species on the list are very poorly known.]

Section *Australimusa* E. E. Cheesm. in Kew Bull. **2**, 108, 110 (1947)

18. *M. textilis* Née (Kew Bull. **4**, 267: 1949)
19. *M. maclayi* F. Muell. ex Miklouho-Maclay (Kew Bull. **5**, 28: 1950; **8**, 571: 1954; **11**, 484: 1957)
20. *M. peekelii* Lauterb. (Kew Bull. **4**, 450: 1950)
21. *M. lolodensis* E. E. Cheesm. (Kew Bull. **5**, 27: 1950)
22. *M. angustigemma* Simmonds (Kew Bull. **8**, 573: 1953)

[Remarks: *M. jackeyi* Hill (Kew Bull. **11**, 485: 1957) from Queensland is of very doubtful status; the Manokwari plant mentioned above may also be a new species.]

Section *Callimusa* E. E. Cheesm. in Kew Bull. **2**, 108, 112 (1947)

23. *M. coccinea* Andr. (Kew Bull. **5**, 29: 1950)
24. *M. violascens* Ridl. (Kew Bull. **5**, 152: 1950)
25. *M. salaccensis* Zoll. (Kew Bull. **2**, 112: 1947)
26. *M. borneënsis* Becc. (Kew Bull. **5**, 151: 1950)
27. *M. gracilis* Holttum (Kew Bull. **5**, 152: 1950; **11**, 488: 1957)
28. *M. campestris* Becc. (Kew Bull. **2**, 112: 1947)
29. *M. hirta* Becc. (Kew Bull. **2**, 112: 1947)
30. *M. angcorensis* Gagnep. (Kew Bull. **2**, 112: 1947)
31. *M. splendida* A. Chev. (Kew Bull. **2**, 112: 1947)
32. Probable new species from Borneo mentioned above.

[Remarks: *M. hirta* is a good species but may not belong here. *Musa angcorensis* and *M. splendida* are very poorly known; they may not be good species and they may not belong in *Callimusa*.]

Section undetermined

33. *M. lasiocarpa* Franch.
34. *M. ingens* Simmonds
35. *M. beccarii* Simmonds

IV. RECENT RECORDS OF ENSETE IN ASIA

Ensete in New Guinea

New Guinea: New Britain, Taliligap, near Rabaul, on a fired hillside, alt. 300 m., 23 Nov. 1954, *Simmonds* B.E. 10, photo. 8/5, 8/6, 8/7 (K):—vernacular name 'Wuduwudu'; New Britain, Gaulim, near Rabaul, 1 Dec. 1954 (a non-flowering plant), *Simmonds* photo. 9/3, 9/4 (K); New Ireland, Laupul, 26 Nov. 1954 (a non-flowering plant), *Simmonds* photo. (K):—vernacular name 'Avadudus'; Madang District, Saidor, in open grassy places on the abandoned airstrip, at low altitude, 14 Dec. 1954, *Womersley & Simmonds* B.E. 28, 29, 30, photo. 13/7, 13/8 (K); Marawasa, near Chasan gap, between Markham Valley and Aiyura, alt. 600 m., in second growth and open grassland, 21 Dec. 1954, *Womersley & Simmonds* B.E. 39, photo. 16/2, 16/3 (K); Gusap, Markham Valley, alt. 300 m., 1953 *Womersley s.n.* (K) = I.C.T.A. Intr. 400.

Remarks

The collections listed above are all more or less fragmentary, a complete series of male and female flowers and mature fruits not having been obtained in any one locality. However, they jointly represent one species characterized by: its moderate to large stature (2–4 m. to the bunch); rusty-orange juice; waxy sheaths, petioles and bracts; slightly swollen pseudostem bases; hermaphrodite basal flowers; long-persistent glaucous green bracts; male flowers with an outer perianth of three linear, coherent tepals, five anthers, and a complex inner tepal, this last consisting of two large irregularly dentate lateral lobes that quite enfold the filaments and a narrow central lobe produced into a slender apiculus; lack of pigmentation in the male flowers, which are uniformly white or translucent; and subglobose seeds 10–12 mm. in diameter with a deep (3 mm.) hilar cavity, a slightly developed umbo with apical pit opposite the hilum and a black, smoothly irregular surface.

This is undoubtedly *Ensete calospermum* (F. Muell.) E. E. Cheesm. The type is a single seed in the National Herbarium, Melbourne (MEL)* labelled '*Musa calosperma* (Northern New Guinea) Moresby Island', which agrees perfectly with the seeds described above. Letters from Miklouho-Maclay to von Mueller (also in MEL)* make it clear that Miklouho-Maclay saw fruits at Moresby Island in 1879 but lost the specimens; the seed that ultimately became the type came from a necklace collected on the Maclay coast, where he did not see plants. There is also at Melbourne* a collection by W. V. Fitzgerald (Oct. 1895) from the Mambare River.

The known distribution of the species is therefore along the north coast of New Guinea from the Madang area to the southeastern peninsula of the island, the northern end of New Britain and neighbouring New Ireland. Probably it is rather more widespread than this but it does not seem to occur in the south-central parts of the island (i.e. in Papua westwards of Port Moresby); neither is there any record for western New Guinea. To the east, it may perhaps be distributed further than we know at present, into the Solomon Islands and New Hebrides, as suggested by the occurrence of *Ensete* seeds in sea drift on the coast of Fiji (Guppy, see E. E. Cheesman in Kew Bull. **2**, 102: 1947). The seeds, being favoured for necklaces and other personal ornaments, are often traded in New Guinea and are sometimes

* I am indebted to the Melbourne Herbarium for the loan of specimens and to the Queensland Department of Agriculture for providing photographs of these interesting materials.

found hundreds of miles from the nearest known living plants (Simmonds in Trop. Agric. **33**, 260: 1956). Ecologically the species is interesting in that, like the African species, it thrives in competition with grasses in the open sun (a situation which no species of *Musa* will tolerate) though it is also found in second growth. It must be fairly fire-tolerant; one collection near Rabaul (B.E.10) came from a plant that had evidently regrown after burning and this fact probably accounts for its stunted habit and poor bunch development. In altitude the species ranges from sea level (BE.28–30) up to 1560 m. near the Chasan gap above the Markham Valley.

ENSETE IN SE. ASIA

ASSAM: Barnihat District, near Gauhati, cultivated from seeds brought from Garo Hills, 3 May 1955, *Simmonds s.n.* (plants immature, no specimens collected):—vernacular name 'Ramkal' (Assami), 'Adumutong' (Khasi), both meaning 'big banana'.

BURMA: locality unspecified, cultivated in West Bengal at Kalimpong Agricultural Station, *Simmonds* B.E. 84 (dried seeds only, growing plants immature).

THAILAND: N. Thailand, Chiengmai Province, Djoo Galaho village near Chiengdao, alt. 450 m., 1 Apr. 1955, *Simmonds* B.E. 72 (K).

REMARKS

Information about these plants is fragmentary. All agreed in having but slightly swollen pseudostem bases, strongly waxy sheaths and petioles (but not leaves) and a juice that swiftly turned rusty-orange on exposure to air; the seeds of B.E.84 agreed very well with those of B.E.72. Taken jointly, these records indicate the existence of a species fairly widely distributed in the Assam–Burma–Thailand area. Presumably it is *Ensete glaucum* (Roxb.) E. E. Cheesm. which was based on a Burmese plant but never really satisfactorily described (Fl. Br. Ind. **6**, 262: 1892; Kew Bull., Add. Ser. **6**, 17: 1906). It is clear, however, that *E. glaucum* was a big waxy plant with persistent green bracts and seeds 'nearly half an inch' in diameter.

An interesting fact about these plants is that the completest collection from the area, B.E.72, differed in no essential respect from *Ensete calospermum*. In habit, waxiness, juice colour, bract characters, and seed structure the plants agreed; the male flowers of B.E.72 were smaller than those of, say, B.E.39 but they came from a much older male bud and, size notwithstanding, were of very similar structure and pigmentation. This observation is below made the basis of a reduction of *E. calospermum*.

Other collections from the Burma–Thailand area which probably represent *E. glaucum* are: *Kurz* 411 from Pegu Yomah, Burma (in Calcutta Herbarium); *Annandale* 317, 27 Feb. 1917, from Inle Lake, Shan States, Burma (said to be planted by monks; in Calcutta Herbarium); *Put* 426, 21 Oct. 1926, from Doi Chiengdao, Thailand (in Kerr collection in the British Museum—? seeds smaller than usual).

V. OTHER RECORDS OF ENSETE

MADAGASCAR

Ensete perrieri (Claverie) E. E. Cheesm. was described from Madagascar (Ann. Mus. Col. Mars., sér. 2, **7**, 74: 1909; C.R. Acad. Sci. Paris **140**, 1612: 1905) but I have seen no collections and cannot comment on its status. From Perrier de la Bathie's photograph (De Wild., Les Bananiers 70: 1913), its affinity would seem to be with the tall species, *E. glaucum* from Asia or *E. ventricosum* (Welw.) E. E. Cheesm. from Africa.

India

Apart from *E. glaucum* (which was a Burmese plant rather than an Indian one in the modern sense of the word) India has only one known good species, *E. superbum* (Roxb.) E. E. Cheesm., known from hilly country on the western side of the peninsula from Bombay to Madras. It is characterized by the enormously swollen base of the pseudostem, the orbicular bracts, 'dull claret-brown' in colour and the seeds 8–12 mm. in diameter (Kew Bull., Add. Ser. **6**, 14 (1906)).

Ensete nepalensis (Wall.) E. E. Cheesm. is not a good species. It is known only from two drawings at Kew and was said to grow on the lower slopes of the Himalaya below Nepal. King (letters in Kew Herbarium) could find no trace of the species in the type area and I heard no word of any *Ensete* in the foothills further to the east in 1955. I therefore follow King in regarding it as *E. glaucum* misattributed as to origin. The species is mentioned by Kerr (Journ. Siam. Soc. Nat. Hist., Suppl. **8**, 197–212: 1929) as growing at the Tap Tao cave, Muang Fang, Chiengrai Province, Thailand, cultivated by Buddhist monks for religious reasons; but no details are given and the record may well be disregarded.

Thailand and Burma

There are indications of the presence of an *Ensete* quite different from *E. glaucum* in the area. *Kerr* 6721 (Me Chem, Chiengmai, Thailand, 10 July 1922, vernacular name 'Klue pam pa' (BM)) represents a small plant (3 m. tall overall), with an elongated crown and leaves which show a gradual rather than an abrupt decline in size before the bunch (being in this reminiscent of the small African species, *E. gilletii* and *E. homblei*). The male bracts are non-persistent and the fruits and seeds are small (the latter ca. 4 mm. but probably immature). According to Cheesman (Kew Bull. **2**, 104: 1947) the plant had dull red bracts and red sap.

Another collection (*Kostermans*, Kwae Noi River Expedition 763, Koeng Chada Village, Rang Ti River Valley, 15 km. east of Wangka, [east central] Thailand, 28 May 1946 (K)) suggests a similar sort of plant but with persistent green bracts. It might, just possibly, represent a depauperate *E. glaucum*, however, as might *Gilbert Rogers* 899 (Mohint Forest Rest-house, Yamethin District, alt. less than 300 m., 4 Aug. 1916, vernacular name 'Nga pyaw yin bin' (CAL)). Investigation in the field is necessary.

China

Two species of *Ensete* have been recorded for China. The first is *E. lasiocarpum* (Franch.) E. E. Cheesm. which was discovered at 1200 m. altitude in Yunnan in 1885 by the Abbé Delavay (Kew Bull., Add. Ser. **6**, 15: 1906; E. E. Cheesm. in Kew Bull. **2**, 102: 1947). It is a dwarf, virtually stemless plant with a dense, erect inflorescence, a swollen and fleshy inflorescence-axis, and a hairy fruit which is dry rather than fleshy at maturity and very few-(4–6-) seeded. The illustration in the Kew Bulletin (*loc. cit.*) certainly suggests an *Ensete* in general appearance but the plant is said to be rhizomatous and the perianth structure is like that of *Musa*. Recent investigations, reviewed below, suggest that perianth characters are critically diagnostic of

genus and I prefer to regard the plant as a *Musa* until it shall be recollected and its status determined.

The second Chinese species is *Ensete wilsoni* (Tutcher) E. E. Cheesm. (Gard. Chron., ser. 3, **32**, 450: 1902; Kew Bull. **2**, 103: 1947). It was described from plants raised in Hongkong from seeds collected in Yunnan. It differs in no essential respect from *E. glaucum* and, though I have not seen authentic specimens, I have no hestitation in reducing it.

Philippine Islands

The native *Ensete* of these islands (vernacular name 'Virgen') has long been regarded as *E. glaucum* and, so far as the information goes, this seems to be correct. According to Teodoro (Philipp. Journ. Sci., Sect. C, **10**, 387: 1915) and Quisumbing (Philipp. Agric. Rev. **12**(3), 14: 1919) it is 'scattered through Luzon' but uncommonly; it was said to be variable in the degree of swelling of the base of the pseudostem and to have coloured sap (though what colour was not stated). Figures which at least do not disagree with the idea that this is *E. glaucum* are given in Philipp. Agric. Rev. **6**, 413 (1913) and Journ. Hered. **5**, 275 (1914).

Indonesia

I know of no record of any *Ensete* from the great islands of Borneo or Sumatra (or, for that matter, from Malaya) but there are two records from the main southern arc of islands east of Sumatra. First, and most important, there is the description by Backer (Fl. van Java **3**, 131: 1924) of a plant wild at Kangean (island off the eastern end of Java) that he referred to *Musa glauca* Roxb.; his description is excellent and agrees in all significant respects with my understanding of the species in Thailand and New Guinea; the only discrepancies worth remark are that the flowers had a tinge of yellow in the perianth and that the minor lobes of the outer perianth were better developed.

Second, a specimen in the British Museum (*Forbes* 4106) from Timor shows that an *Ensete* of this affinity (the specimen is not really determinable) occurs in the island.

VI. GENERAL REMARKS ON ENSETE

Since Cheesman (Kew Bull. **2**, 100: 1947) outlined his conception of *Ensete* as a genus distinct from *Musa*, information about both the African and Asian species has accumulated which allows a more complete definition of generic characters (Baker & Simmonds, in Kew Bull. **8**, 405–16: 1953; 574: 1954; Milne-Redhead in Hook., Icon. Pl. **35**, t. 3479 (1950); this paper). A brief discussion may therefore be useful.

Monocarpic habit

Members of *Ensete* are typically unbranched and monocarpic though a natural exception is probably provided by *E. homblei* (Bequaert ex De Wild.) E. E. Cheesm. (Milne-Redhead, *loc. cit.*). That suckering can be induced in normally unbranched plants of *E. ventricosum* (Welw.) E. E. Cheesm. by

suitable treatment of the corm of a plant in the pre-flowering stage is not generally known, although it is an established agricultural technique in Ethiopia (Smeds in Acta Geograph. Helsinki, **13**(4), 39: 1955; Simmonds in Trop. Agric. **35**, 302–7: 1958). Most members of *Musa* sucker abundantly but *M. ingens* sometimes does so only very sparsely, approaching *Ensete* in this respect. Monocarpic habit is therefore a useful though not absolutely reliable criterion of generic difference.

Shape of pseudostem

No banana pseudostem is quite columnar—it is always somewhat swollen at the base, generally more so in *Ensete* than in *Musa*. But the character is very variable in *Ensete*, the swelling being conspicuously developed in, e.g., *E. homblei* and *E. superbum*, much less in *E. ventricosum* and *E. glaucum*; in the latter species, the swelling may be no greater than in some species of *Musa*, though the rather lax leaf-sheaths may contribute to an illusion of swelling. The character is not therefore a very useful one.

Insertion of bracts

This important character has not, so far as I know, previously been recognized. In *Musa* the flowers and bracts are attached independently to the axis and absciss or persist independently; this is readily apparent from examination of the scars. In *Ensete*, by contrast, the flowers emerge from a pad of tissue that is integral with the base of the bract and the whole structure, bract-plus-flowers, is integral with the axis—that is to say, there is no definable point of insertion marked by an abscission layer. The result is that the bracts and flowers of *Ensete* are always potentially persistent and when they disappear from the male axis, as they often do in, say, *E. ventricosum* (Kew Bull. **8**, 412–4: 1953), they do so by rotting rather than by abscissing. (The word 'deciduous' used by Baker & Simmonds (*loc. cit.*) in this connexion is therefore misleading).

I have verified this character on living plants of *E. ventricosum*, *E. glaucum* (incl. *E. calospermum*), and on Kerr 6721 which represents the undescribed small species from Thailand mentioned above; Milne-Redhead's figure suggests that it occurs also in *E. homblei* and the strongly persistent bracts of *E. perrieri* (figure cited above), *E. gilletii* (De Wild.) E. E. Cheesm., *E. superbum* (Kew Bull., Add. Ser. **6**, 14: 1906) likewise jointly suggest that the character is typical of the genus.

Sex of flowers

Members of *Musa* (with several striking exceptions) have basal flowers which are functionally female and contain stamens reduced to staminodes. The few exceptions (e.g. *Musa velutina* Wendl. & Drude, *M. schizocarpa* Simmonds, *M. acuminata* subsp. *banksii* (F. Muell.) Simmonds) show either an abrupt transition from fully hermaphrodite basal flowers to male or a more gradual transition from female through hermaphrodite to male. This last condition appears to be normal in *Ensete* though the character has rarely been critically examined. There is commonly a degree of irregularity of stamen-development in the hermaphrodite flowers. The occurrence of

perfect stamens in some at least of the basal flowers has been established for *E. ventricosum*, *E. homblei*, *E. glaucum* (in Java, *fide* Backer, *loc. cit.*) and *E. calospermum*; it should be sought in the other species. As a diagnostic character it is little use because not uncommon in *Musa*.

Structure of perianth

The perianth of all species of *Ensete* so far critically examined is quite different from that of *Musa*. The outer perianth (equivalent to the 'compound tepal' of *Musa*) consists of three linear lobes, coherent at the two adjacent margins but not fused or fused at the base only, with or without two small accessory lobes attached to the edges of the central lobe about the middle; the accessory lobes may well be constantly present but are sometimes difficult to find in museum material, being frequently enfolded in the curled and separated tips of the major lobes. The inner perianth (the 'free tepal' of *Musa*) is a three-lobed structure, consisting of a narrow central segment, acute or long-apiculate at the tip, that contains the midvein of the tepal, and two, suborbicular, ragged-dentate, lateral lobes that quite enfold the filaments. It is about as broad as long (somewhat more or less) and in this, as well as in its three-lobed structure, is quite different from the free tepal of *Musa* which is longer than broad, often several times longer. In *Ensete ventricosum* the free tepal is sometimes (?more or less freakishly) replaced by three separate lobes (Baker & Simmonds, *loc. cit.*).

The characters of the perianth have been checked for *Ensete ventricosum* and *E. homblei* (Milne-Redhead, *loc. cit.*) in Africa and for *E. glaucum* (including *E. calospermum*) in Asia. It is found also in *E. superbum*, as the figure in Kew Bull., Add. Ser. **6**, 14 (1906) shows. *Ensete lasiocarpum* (Franch.) E. E. Cheesm. presents a problem: though undoubtedly reminiscent of *Ensete* (as remarked above), it has the perianth of a *Musa* (Kew Bull., Add. Ser. **6**, 15: 1906); this strongly suggests that its proper place is in the genus under which it was described, and it is so treated here (pp. 203–4).

Seed size

Ensete, on the average, has larger seeds than *Musa* but the genera overlap in this respect. Seed sizes in *Ensete* are as follows: *E. ventricosum*, 12–18 mm. in mean diameter; *E. gilletii*, 7–9 mm.; *E. homblei*, 6–7 mm.; *E. glaucum* (incl. *E. calospermum*), 9–12 mm.; *E. superbum*, 8–12 mm. (ex descr.—'$\frac{1}{3}$–$\frac{1}{2}$inch'). The seeds of most members of *Musa* are 5–6 mm. in diameter ranging up to relatively large-seeded species in section *Musa* of northeastern India, *M. sikkimensis* Kurz and *M. cheesmani* Simmonds (each ca. 7 mm.—Kew Bull. **8**, 478, 480: 1956) and *Musa ingens* Simmonds from New Guinea (also 7 mm.). There is therefore considerable overlap between the two genera in the range 6–7 mm.

Pollen characters

In a recent paper, Koupriianova (Doklady Akad. Naouk S.S.S.R., **101** (6) 1131–3: 1955) has drawn attention to a difference between the two genera in respect of pollen structure. *Ensete* (represented by a plant referred to *E. schweinfurthii* (Schum. & Warb.) E. E. Cheesm. (i.e. *E. ventricosum*) had

large grains 140–150μ in diameter with a warty surface and a thin exintina (1·7μ); *Musa* (represented by *M. balbisiana* Colla, *M. acuminata* Colla, *M. ornata* Roxb. and *M. textilis* Née) had smaller grains (75–118μ) with a finely granular surface and a thick exintina (5·1–6·8μ). Milne-Redhead's figure (Hook., Icon. Pl. **35**, t. 3479A/7) of *E. homblei* shows a grain about 120μ in diameter with a warty surface, in essential agreement with Koupriianova's results. This seems to be an important character and it would be well to have confirmation for other species.

Chromosome number

All the species of *Ensete* so far counted have 2n = 18; species of *Musa* have 2n = 20 or 22, exceptionally 2n = 14 (*M. ingens*) or 2n = 18 (*M. beccarii*). Chromosome number is therefore not quite diagnostic of genus but is very nearly so; the one *Musa* that has 2n = 18 is not in the least like *Ensete* in other respects so it looks as though this chromosome number has originated twice, independently, in the group.

In sum, therefore, our present knowledge suggests that Cheesman's resurrection of *Ensete* as a distinct genus was well founded and that the genera may be diagnosed as follows:—

Musa: perennial, stooling or rhizomatous herbs; leaf sheaths tightly clasping; pseudostems slightly swollen at the base; *bracts and flowers inserted independently on the axis, commonly (except for functionally female ovaries in basal hands) deciduous by abscission*; basal flowers generally functionally female only, sometimes (variably) hermaphrodite; *perianth of one, compound, 5 (3 + 2)-toothed outer tepal and a simple free (inner) tepal which is 1·5 or more times longer than broad*; seeds 7 mm. or less in diameter; *pollen grains with a finely granular surface*, smaller than those of *Ensete*; *somatic chromosome number 20 or 22, very rarely 14 or 18*.

Ensete: monocarpic, unbranched herbs; suckering rare unless induced; leaf sheaths rather lax, loosely clasping; pseudostems slightly or, sometimes, markedly swollen at the base; *bracts and flowers integral with each other and with the axis, persistent (deciduous only by rotting, not by abscission)*; basal flowers (variably) hermaphrodite; *perianth of three coherent linear outer tepals* with (? sometimes without) two minor inner lobes on the central one, and a *free inner tepal consisting of two large lateral suborbicular lobes and a narrow (often long-apiculate) central lobe, less than 1·5 times as long as broad* (without the apiculus); seeds (5–) 6 mm. or more in diameter; *pollen grains with a regularly warty surface*, larger than those of *Musa*; *somatic chromosome number 18*.

VII. AN ANNOTATED CHECK-LIST OF ENSETE

1. **Ensete ventricosum** (*Welw.*) *E. E. Cheesm.* Widely distributed in central Africa from the Cameroons eastwards to Ethiopia and southwards to the Transvaal.
2. **E. gilletii** (*De Wild.*) *E. E. Cheesm.* Widely distributed in central Africa from Sierra Leone to Nyasaland.
3. **E. homblei** (*Bequaert ex De Wild.*) *E. E. Cheesm.* Of restricted distribution in the southern Congo and Northern Rhodesia.

4. **E. perrieri** (*Claverie*) *E. E. Cheesm.* Madagascar; status and relationship unknown.

5. **E. glaucum** (*Roxb.*) *E. E. Cheesm.* (*E. calospermum* (F. Muell.) E. E. Cheesm., *E. nepalensis* (Wall.) E. E. Cheesm., *E. wilsoni* (Tutcher) E. E. Cheesm.). Widely but sparsely distributed in Burma (probably also Assam), Thailand, southwestern China, Philippine Islands, New Guinea and Java.

6. **E. superbum** (*Roxb.*) *E. E. Cheesm.* Western peninsular India.

7. Undescribed species from Thailand.

This list is by no means final but it is at least clear that the genus is much smaller and less distinctively African than it seemed to be a few years ago; it represents five to seven species of which one half are African, instead of the 25 species (of which 20 were African) listed by Cheesman in 1947. And even the seven species given here may be too many, for the status of *E. perrieri* has yet to be determined and, surprising as it may seem, it is by no means certain that the African *E. ventricosum* is distinct from the Asian *E. glaucum*. I saw living plants of each at an interval of seven years but had the impression that there was no constant difference of facies by which they might be distinguished. Comparison of notes and photographs reinforced this impression: down to details of waxiness, juice colour, bract and flower structure and seed characters, the two species are indeed very similar. The only constant difference revealed is in pigmentation of the male flowers: *E. glaucum* has pure white male flowers* with white anthers and pollen whereas *E. ventricosum* has the perianth tipped with orange-yellow, the anthers violet or purple, and the pollen yellow or greyish (Baker & Simmonds, *loc. cit.*). Pending the acquisition of a better knowledge of *E. glaucum* the two may be regarded as distinct but it might ultimately prove necessary to reduce *E. ventricosum*.

Peruvian Orchids.**—The second part of Mr. Charles Schweinfurth's admirable account of the orchids of Peru maintains the excellent standard set up in part 1. The present part takes Schlechter's classification up to and including *Epidendrum* which, together with *Pleurothallis*, occupy the greater part of the book. Mr. Schweinfurth recognises 116 and 149 Peruvian species of *Pleurothallis* and *Epidendrum* respectively but he takes a rather broader view of both genera than is accepted by some taxonomists. It seems a pity, however, that he has not been able to correlate the numerous species of the latter genus described by Ruiz and Pavon with those of later authors; it is to be hoped that such critical comparison may be possible at some time in the not too distant future.

The part is illustrated by 58 excellent line drawings similar to those in part 1, while, as before, the descriptions and keys reach a high standard. We shall look forward to the appearance of the remaining parts of the work.

V. S. SUMMERHAYES

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* But Backer noted the presence of a tinge of yellow on the perianth of Javanese material (see p. 208).

** *Orchids of Peru.* By C. Schweinfurth. Part 2 (Fieldiana: Botany, vol. 30, No. 2). Pp. 271, 58 figures. Chicago: Chicago Natural History Museum, 1959. Price $4.50.

A new species of *Cordyla* from Somaliland

J. B. Gillett

Cordyla somalensis *Gillett*, sp. nov.

[*C. africana* sensu Chiov., Fl. Somala **1**, 154 (1929) et **2**, 172 (1932); Cufodontis, Enum. Pl. Aethiop. Sperm. in Bull. Jard. Bot. Brux. **25**, suppl. 225 (1955); non Loureiro (1790)].

Ab 4 speciebus hujus generis adhuc cognitis (a cl. E. Milne-Redhead in anno 1937 insigniter descriptis) lineis perlucidis prope marginem foliolorum et non alibi repertis, floribus cum foliis ad apicem ramorum foliosorum latis et notis tabulae sequentis differt.

	pinnata	*richardii*	*densiflora*	*africana*	*somalensis*
Arboris proceritas	10–16 m.	3–10 m.	3–8 m.	13–30 m.	1–5 m.
Foliolorum num. max. ...	13–21	13–31	17–19	17–29	11–13
Foliolorum long. max. ...	4–7 cm.	4 cm.	3·5 cm.	3–5 cm.	2–2·7 cm.
Foliolorum lat. max. ...	2–3 cm.	1·7 cm.	2 cm.	1·4–2 cm.	1–1·3 cm.
Pedicelli long. max. ...	8–13 mm.	13 mm.	5(9) mm.	8 mm.	(7)12–16 mm.
Pedicelli pilorum long. max.	0·3 mm.	0·7 mm.	0 vel 0·6 mm.	0·1–0·2 mm.	0·2 mm.
Staminum numerus ...	90–100	80–90	50–60	35–45	110–120
Styli longitudo	3–6 mm.	5–6 mm.	5–6 mm.	c. 3 mm.	6–9 mm.

Arbor parva [vel frutex], [1–]3[–5] m. alta; rami juniores subaurantei, minute pubescentes; rami vetustiores grisei. *Folii* rhachis subaurantea, minute pubescens, ad 10 cm. longa, petiolo ad 1·5 cm. longo incluso, ultra foliola lateralia ad 9 mm. prolongata; stipulae caducae, pubescentes, triangulariae, ad 1 mm. longae [vel liguliformes et ad 3 mm. longae]; stipellae nullae; petioluli 1–1·3 mm. longi; foliola 11–13, terminale aliis simile, lateralibus alternatis vel rarius oppositis, elliptica, apice rotundata [vel paulo emarginata], basin rotundata vel acuta, utrinque minute subappresse pubescentia, pilis subrectis, 11–24[26] mm. longa, 6–11[13] mm. lata, nervo mediano supra impresso, infra eminente, subflavo, nervis lateralibus utrinque obscuris, punctis perlucidis ± paucis inaequaliter dispositis, lineis perlucidis semper ad marginem solum dispositis. *Racemi* terminales supra folia contemporanea vel in axillis foliorum contemporaneorum dispositi, ad 6 cm. longi, minute pubescentes; bracteae caducae, ± ovatae, c. 1 mm. longae; bracteolae oblongae, 1–2 mm. longae, ad, vel supra, mediam pedicellorum; pedicelli minute pubescentes, pilis 0·1–0·2 mm. longis, ad 16 mm. longi sed saepe multo breviores. *Calyx* extus minute pubescens, pilis 0·1–0·2 mm. longis ad apicem praecipue intra lobos pilis duplo longioribus; tubus 5 mm. longus; lobi 3, ovati, 9 mm. longi. *Stamina* 110–120, basin connata, tubum 1–1·5 mm. longum fingentia, supra eum in circulis tribus disposita, externa c. 23 mm., media c. 16 mm., interna c. 12 mm. longa; anthera 0·8 mm. longa. *Ovarium* florum ♀ (inferiorum) glabrum, longe (ad 19 mm.) stipitatum, c. 5 mm. longum, 3-ovulatum; stylus teres, ad 9 mm. longus, sensim attenuatus, apice truncatus, stigmate minuto discoideo. *Flores* ♂ (superiores in racemo) minores; calycis tubus 4 mm., lobi 6 mm., stamina ad 17 mm. longa; ovarium sterile in toto c. 3 mm. longum. *Legumen* c. 2 cm. stipitatum, complanato-globosum, c. 3 cm. diametro, indehiscens, 1-spermum. *Cotyledones* crassi, cordato-auriculati.

Ethiopian Ogaden. Area around Uardere: 6° 45′ N., 45° 40′ E., rare, 1953, *P. E. Ellis* 41 & 50. 6° 50′ N., 44° 10′ E., 900 m., on gravel and sandy soils, open scrub with shrubs under 6 m. tall and 10–20 m. apart, tree up to 4 m. tall, occasional, 18 Oct. 1953, *P. E. Ellis* 126. 7° 0′ N., 45° 10′ E., 600–750 m., rich red sandy soil, open scrub with bushes about 3 m. tall and 10 m. apart, rounded tree up to 3 m. tall, stamens cream, smelling sweetly of cheap scented soap, occasional, 20 Nov. 1954, *P. E. Ellis* 328 (holotype). 6° 20′ N., 45° 15′ E., red sandy soils, mixed *Acacia–Commiphora–Terminalia* open scrub, tree up to 4 m. tall, Somali name 'Ontoro', 16 Oct. 1954 fruiting, *C. F. Hemming* 371. 7° 0′ N., 45° 28′ E., bushy tree 3–5 m. tall, flowers yellow, Somali name 'Ontoro' or 'His', 29 June 1958, *C. F. Hemming* 1458. 6 km. E. of Mersin, 7′36′N., 45°0′E., Somali name 'Ontoro', 15 July 1958, immature fruit, *C. F. Hemming* 1557.

The two following specimens, though said to be from British Somaliland, probably also came from the Uardere area (then British-administered). 'British Somaliland', Haud (south); Wadire, red soil, open tree c. 3 m. tall, grazed by all stock, fruit eaten when red ripe, Somali name Gosi, 14 Aug. 1941, *E. F. Peck* 42. Untoro, 450 m., 28 Aug. 1941, *E. F. Peck* 386.

Somalia. Area c. 3° 50′–4° 20′ N., 45° 30′–50′ E.: 55 km. NE. of Bulo Burti, orange red soils, mixed open scrub, large wide bush up to 2·5 m. tall, stamens yellow, Somali name 'Ontoro', 6 Nov. 1954, *C. F. Hemming* 403 (*Stefanini & Puccioni* 136 not seen).

Coastal area from Merca to Mogadiscio, 1° 45′–2° 10′ N.: Merca, dunes, dominant shrub forming large clumps 1–1·5 m. tall, branches very hard, stamens white, immature fruits green with darker longitudinal streaks, 29 Jan. 1954, *Bally* 9527. In addition the following gatherings have not been seen:—*Stefanini & Puccioni* 42, *Scasselati* 130, *Senni* 687.

Notes

1. *Bally* 9527 differs from the other specimens in having rather larger leaflets, inflorescences on leafless shoots (although leaves were obtained from other parts of the bush at the time of flowering) and pedicels which, though fully mature, are not above 7 mm. long. When the range of variation in this coastal plant is better understood it may be advisable to recognise in it a distinct variety or subspecies.

2. The leaflets of all species of *Cordyla* show pellucid markings which may be of 3 types: (a) *round dots*, (b) *oblong or elliptic dots* and (c) *streaks*. There is a good deal of variation within each species in the number and frequency of these dots and streaks but every leaflet of *C. somalensis* which was examined showed streaks at and running into the margin, but not elsewhere; whereas in other species pellucid streaks were either absent or distributed all over the leaflet.

3. In *C. pinnata*, *C. richardii* and *C. densiflora* flowers are borne on shoots which are leafless at the time; in *C. africana* racemes are borne in the axils of fallen leaves below the contemporary leaves on the same shoot. Only in *C. somalensis* (except *Bally* 9527) are flowers borne either in terminal racemes above contemporary leaves or in racemes in the axils of contemporary leaves.

4. As may be seen from the map in the revision of the genus by E. Milne-Redhead (Fedde, Rep. **41**, 227–235, tab. 220: 1937), the species of *Cordyla* occupy areas which do not overlap, although that of *C. densiflora* is more or less contiguous to that of *C. africana*. *C. somalensis* is no exception to this rule, there being a gap of some 900 km. between its southernmost known locality at Merca and the nearest locality for *C. africana* in Southern Kenya. Discontinuous distributions are of course often an indication of antiquity and *Cordyla*, which has been placed sometimes in the *Papilionoïdeae* and sometimes in the *Caesalpinioïdeae*, is probably an ancient genus.

5. *C. somalensis*, which needs an annual rainfall of only 250 mm., is the most xerophytic species of *Cordyla*. As it is said to be grazed by all stock and produces a large edible seed it mayprove of economic value in increasing the productivity of tropical arid regions. Such plants under the present tragic conditions of ever increasing over-grazing are liable to be exterminated in the Horn of Africa and should be brought into cultivation at some experimental station with a suitable climate so that seed may be available for future experiments.

6. *C. madagascariensis* Vig in Not. Syst. **13**, 355 (1949) has not been seen. From the description it agrees with *C. africana* in habit and in number of leaflets and stamens.

A pocket guide to British plants.*—The 'Flora of the British Isles' by Messrs. Clapham, Tutin and Warburg has, in seven years, quite supplanted Hooker's 'Students' Flora' and Babington's 'Manual' as the standard guide to British plants. The same three authors, encouraged no doubt by the success of this earlier incursion into British botany, now furnish us with a pocket version of their Flora. In format the present volume closely resembles the Flora, but space has been saved by omitting most of the text figures, by restricting the number of species described in detail, and by leaving out much of the supplementary biological information that was such a valuable feature of the larger work. Although many rare, critical and alien species are not given descriptions, most of the plants mentioned in the Flora are included in the excellent keys, and it is gratifying to see that *Artemisia norvegica*, *Diapensia lapponica* and *Koenigia islandica* (three outstanding novelties closely associated with Kew) are now accepted components of the British flora. Who would have thought, in 1952, that within a very short time two genera and one family would be added to our well-worked—some would say overworked—flora?

The very condensed, technical style of the descriptions, and the omission of much non-taxonomic information, make the 'Excursion Flora' light reading only as regards avoirdupois. It is quite frankly a scholar's digest and not a bedside book. Perhaps it was this austere, unsmiling approach to British botany that persuaded the authors to give their pocket-book such a lugubrious teutonic title. How one wishes they could have given the baby a nicer name!

R. D. Meikle

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* *Excursion Flora of the British Isles*. By A. R. Clapham, T. G. Tutin and E. F. Warburg. Pp. xxxiii + 579. Cambridge: The University Press, 1959. Price 22/6.

The names of the Cornish and the Jersey Elm

R. Melville

For many years the Cornish Elm was known as *Ulmus stricta* Lindl., but on examining the elms of the Dumortier Herbarium in 1951 (Bull. Jard. Bot. Brux. **21**, 351: 1951) I discovered that *U. reticulata* Dumort. was another and earlier name for this species. It was published in Dumortier's 'Florula Belgica' of 1827 and the type specimen consists of a fairly vigorous shoot such as might be picked from a sapling. The reticulate markings on the lower surfaces of the leaves, which appear to have suggested the name to Dumortier, are the result of feeding by insects. It is not certain how the specimen came into Dumortier's hands, but probably from a correspondent in this country.

On searching the literature for still earlier names for the Cornish Elm, I discovered *U. cornubiensis* in Weston's 'Botanicus Universalis' of 1770 and continued to use this name until it was called into question when reviewing the elm names for Mr. J. E. Dandy's 'List of British Vascular Plants' (1958). To anyone not familiar with the 'Botanicus Universalis', it may appear incredible that an author could leave it in doubt whether he intended a name to stand for a species or a variety. In Weston's book, two sets of numbers are used and roman and italic types. All the possible combinations of errors seem to have been exploited to the full and the errors were left uncorrected. In view of the outcome of the investigation it is not necessary to enter into all the details. Suffice it to say, that a convincing case can be made out for the view that Weston intended *U. cornubiensis* as a species, if only his general treatment of the elms on page 315 is considered. Unfortunately, it was afterwards noticed that Weston gave another list, including the British elms only, on p. 352 of the same work. There, *U. cornubiensis* was clearly placed as a variety under *U. campestris* L.

Five years later, Weston published his 'Flora Anglicana' in which he again gave a list of English elms. The entry relating to the Cornish Elm appears as follows on p. 46.

'4. angustifolia . . . . . 1. Narrow-rough-leaved Cornish Elm
5. *argenteo-variegata* 2. Silver-striped
6. *aureo-variegata* 3. Gold-striped'

In this he has kept correctly to his system, using roman type for the species and italic type for the varieties. If we refer back now to the 'Botanicus Universalis' p. 352 we see there under U. campestris:

'4. *angustifolia* 4. ——minor foliis angustis scabris
Narrow rough-leaved Elm'

. . . . . where the line stands for 'Ulmus'. This is a direct quotation of Goodyer in Johnson's edition of Gerard's 'Herbal' (1633), which was investigated earlier (Melville in Journ. Bot. **76**, 185–192: 1938) and the tree shown to be a variety of the Cornish Elm, growing in Hampshire. The entry for the Cornish Elm itself on p. 352 of the 'Botanicus Universalis' is as follows:

'7. *cornubiensis* 7. ===cornubiensis, foliis minoribus'

It is evident, therefore, that by the time Weston published the 'Flora Anglicana' he had reached the conclusion that the Cornish Elm and Goodyer's Hampshire Elm were varieties of a single species, which was distinct from *U. campestris*. He, accordingly and quite correctly, united them under one epithet ('angustifolia'). In doing so, he chose the element first described, Goodyer's Elm, as the basis of his species. Goodyer's Elm, which I described as *U. stricta* Lindl. var. *goodyeri* Melville (*loc. cit.*) is, therefore, the type variety of the species. The epithet *angustifolia* refers to the narrow leaves of suckers and saplings which Goodyer described.

In horticultural literature the Jersey or Wheatley Elm has been treated as a variety of the Cornish Elm. I had accepted this usage in the absence of conclusive evidence, although C. E. Moss (Gard. Chron. **51**, 199: 1912) had suggested that 'it is perhaps a hybrid of *U. stricta* and *U. nitens*'. Later, H. Bancroft (Gard. Chron. **96**, 209: 1934) also thought the Jersey Elm might be a hybrid. Now, on completing the examination of a comprehensive collection of elms from the Western seaboard of France and Jersey made by Mr. H. M. Heybroek, who is in charge of the Dutch elm-breeding work at Baarn, I have the evidence that was formerly lacking. More or less typical forms of *U. angustifolia* occur in Brittany. Elsewhere in Western France the elm population appears to consist almost entirely of segregants from the triple hybrid *U. glabra* Huds. × *carpinifolia* Gled. × *plotii* Druce, which is widespread in Western Europe. Along the Channel seaboard of France and in Jersey *U. angustifolia* has hybridised with segregants of the triple complex. The elm population of Jersey appears to consist mainly of trees of this complex origin. The clones of the Jersey Elm in common cultivation are segregants in which the characters of *U. angustifolia* predominate.

The following amendments are required to the nomenclature of the Cornish and Jersey Elms:

Goodyer Elm: **Ulmus angustifolia** (*Weston*) *Weston* var. **angustifolia**; Flora Anglicana 46 (1775)

U. campestris L. var. *angustifolia* Weston, Botanicus Universalis **1**, 352 (1770)

U. stricta Lindl. var. *goodyeri* Melville in Journ. Bot. **76**, 189 (1938)

Cornish Elm: **U. angustifolia** (*Weston*) *Weston* var. **cornubiensis** (*Weston*) *Melville*, comb. nov.

U. campestris L. var. *cornubiensis* Weston, Botanicus Universalis **1**, 315, 352 (1770)

U. reticulata Dumort., Flor. Belg. 25 (1827)

U. stricta Lindl., Syn. Brit. Fl. 227 (1829)

Jersey Elm: **U. × sarniensis** (*Loud.*) *Melville*, stat. nov.

U. sarniensis Lodd., Cat. 1836. *Nomen nudum*

U. campestris L. var. *sarniensis* Loudon, Arb. & Frut. Brit. **3**, 1376 (1838). *Nomen subnudum*

U. glabra Mill. forma *sarniensis* Schneider, Handb. Laubholzk. **1**, 220 (1906)

U. stricta Lindl. var. *sarniensis* (Loud.) Moss in Gard. Chron. **51**, 199 (1912)

The Royal Botanic Gardens, Kew, 1759–1959.—The late W. J. Bean's excellent book about Kew Gardens was published in 1908 and has long been out-of-print. A new and up-to-date account of the Gardens is therefore very welcome and its appearance in the year which marks the bicentenary of the Gardens is most appropriate.* The author retired in 1957 after forty-nine years service in the Kew Herbarium, and thus has had not only the opportunity of becoming steeped in the history and traditions of Kew, but also the unique advantage of first-hand experience of all that has happened since Bean's book appeared. This new book is intended 'to interest as wide a circle of the public as possible' and the author says that his object is to state facts accurately but not as dry records. The result is, as the publishers claim, a book 'filled with factual information' on almost everything appertaining to the Gardens—from the etymology of the word 'Kew', and the various forms of it recorded from the fourteenth century onwards, to the position of the lavatories in the Gardens in this year of grace 1959. In other words an attempt has been made to mention everything concerning 'Kew'—its history, the botanical work undertaken in the Herbarium and Jodrell Laboratory, economic botany and the Museums, the collections out-of-doors in the Gardens and in the greenhouses, varying aspects of the grounds in the four seasons of the year, the wild life, situation, surroundings, soil, meterological data, and so on and so on. To pack all this into an octavo volume of 256 pages inevitably means that information about events, persons, and plants is often reduced to a minimum, and not infrequently to a bare record, which does tend to make for dull reading. Even the interesting historical chapters suffer from the brevity necessitated by the reference to so much in so few (less than thirty) pages; the facts are stated all right and names are mentioned, but too often that is all. And yet, curiously enough, there is a certain amount of repetition in these pages. Nevertheless there is a great deal of interesting observation and comment in the book and, as would be expected of the author, the information is very correct. There is, however, one mistake, namely the statement that 45,000 species (excluding varieties and garden hybrids) are grown in the Gardens; this is probably based on a misunderstanding, since 45,000 is the number given by Sir Edward Salisbury ('Discovery', June 1959, p. 248) as the number of *plants* grown at Kew—the number of species is much smaller, 20,000 at most. One other point

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* *The Royal Botanic Gardens Kew, Past and Present.* By W. B. Turrill. Pp. 256, 16 plates (26 photographs) and a map. London: Herbert Jenkins, 1959. Price 25/-.

which calls for comment is the statement (p. 58) that W. J. Hooker became editor of the 'Botanical Magazine' in 1845. That is strictly true in so far as 1845 was the first year in which his name appeared on the title page as editor, but in fact from 1827 to 1844 he was *de facto* editor, wrote all the text, and for the first ten of these years drew most of the plates. The title-pages during this period bear the inscription 'Conducted/BY SAMUEL CURTIS, F.L.S./The Descriptions/BY WILLIAM JACKSON HOOKER, L.L.D.'; Curtis was the proprietor of the 'Botanical Magazine', and the use of the word 'Conducted' to describe his role must surely mean that he was concerned solely with the business side of the undertaking. The necessity for brevity, commented on above, is no doubt the reason for the omission of a note about W. J. Hooker's skill as an artist and also for the bare mention of W. H. Fitch, whom Hooker brought with him to Kew and who was the botanical artist there for thirty-seven years.

The book is embellished by twenty-six photographs, and although none is specifically cited in the text, all but one portray persons or buildings or scenes which are mentioned, the exception being the portrait of Mrs. Aiton—she, poor lady, is most ungallantly ignored.

J. R. SEALY

Bee diseases.*—Every beekeeper in his own interests, should acquire a working knowledge of the diseases and ailments likely to afflict his stock. During recent years much new information has accumulated concerning the diseases of the honeybee and some new methods of treatment have been invented. It is valuable to have these new developments incorporated into the practical accounts of bee diseases provided in a special bulletin on this subject.

The subject matter of the bulletin falls naturally into two sections dealing with brood diseases and diseases of the adult honeybee. Full accounts are given of American and European foul brood, illustrated by an excellent series of photographs, which should leave little doubt in the mind of the beekeeper who is so unfortunate as to encounter either of them. Among adult bee diseases, full instructions are given for the older Frow method of treating Acarine disease as well as the new smoke strip method employing the selective acaricide chlorobenzilate. The account of Nosema disease has been rewritten. The manipulative treatment of this disease is a good example of the application of knowledge of the biology of an organism to its control. Instructions are given also for treatment with the new antibiotic drug fumagillin. Shorter accounts are given of less troublesome diseases and an appendix provides instructions on submitting samples of brood and adult bees for diagnosis.

R. MELVILLE

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* *Diseases of Bees.* Third edition of the Ministry of Agriculture, Fisheries and Food Bulletin No. 100. Pp. iv + 31, 12 half-tone plates (24 figures) and 1 text-figure. London: H.M. Stationery Office, 1959. Price 4/-.

Notes on African *Araliaceae*: I

J. R. Tennant

THE GENUS CUSSONIA THUNB. IN AFRICA

During the revision of the family *Araliaceae* for the 'Flora of Tropical East Africa', it has been necessary to make alterations and additions to the species of *Cussonia* hitherto recognized from our area. Some of the work has involved species outside the area covered by this Flora and conclusions drawn from the study of these are also included.

Cussonia umbellifera *Sond.* in Linnaea **23**, 49 (1850)

The examination of plants formerly determined as *Cussonia buchananii* Harms in the British Museum (Natural History), at Kew and in the East African Herbarium, Nairobi, were found when sorted on a basis of leaflet-shape to fall into two well-defined groups closely correlated with habitat. Harms described the species, citing two syntypes as follows:—Nyasaland, without precise locality, (1895) *Buchanan* 295 and Tanganyika, Morogoro District, Uluguru Mts., Lukwangule Plateau, 2100 m. (Nov. 1894), *Stuhlmann* 9112. Iso-syntypes of the former are at Edinburgh and the British Museum, and a duplicate sheet from the latter institution has recently been received at Kew. Authentic material of the latter syntype has not been seen; the material of the family as a whole was destroyed in the herbarium of the Botanisches Museum, Berlin-Dahlem, during the last war, and duplicates of *Stuhlmann* 9112 were possibly not distributed, at least no material has been found at Kew or the British Museum, and when the authorities at Hamburg were approached nothing was found there. *Buchanan* 295 agrees well with other Nyasaland material, and the group thus typified very nearly grades into *C. umbellifera* [known first from woods near Port Natal and in grassy hills between Osamculo and Omcomas] with which union is here proposed by reducing *C. buchananii* Harms pro parte to a variety.

var. **umbellifera**

Leaflets not abruptly tapering to the apex, generally obtuse, retuse or emarginate (rarely acute); petiolule up to 40 mm. (commonly 25–30 mm.) long.

var. **buchananii** (*Harms*) *Tennant*, comb. nov.

Cussonia buchananii Harms in Engl., Bot. Jahrb. **26**, 251 (1899), pro parte quoad spec. Nyasaland: *Buchanan* 295

Leaflets abruptly tapering to the apex which is generally acute (very rarely emarginate); petiolule 2–12 mm. long.

Amongst the South African sheets there is a form of var. *umbellifera* possessing narrow leaflets, with acute apices, but the fact that these are not abruptly tapering and that the petiolule-lengths are in better accord with the lengths observed in this variety serves to keep var. *buchananii* distinct.

Both varieties occur on Mt. Mlanje, Nyasaland, at an altitude of 1930–1980 m., but whereas var. *umbellifera* has an extended range in South Africa, where altitudes from 0–1550 m. have been recorded and also inter-

mediate records (represented at Kew) from the Chimanimani Mts. at 2150 m., *Swynnerton* 653A, and Inyanga at 1900 m., *Wild* 1477, var. *buchananii*, so far as present gatherings indicate, appears to be restricted to Mt. Mlanje and the locality of Blantyre. In this connection it would be of great interest to know the exact locality of *Buchanan* 295, which possibly itself was collected hereabouts.

In considering the second group of specimens characterized by their narrower leaflets with long-acuminate apices and attenuate bases, the identification with *Stuhlmann* 9112 must remain in some doubt unless a syntype of this number is later found. The same localized habitat being common to all, and the very characteristic leaflets of the collections examined favour the possibility of their being conspecific.

Cussonia lukwangulensis *Tennant*, sp. nov. *C. umbelliferae* Harms affinis, sed foliolis angustioribus, longius acuminatis satis distinguenda.

? *C. buchananii* Harms in Engl., Bot. Jahrb. **26**, 251 (1899), pro parte, quoad syntypum *Stuhlmann* 9112

Arbor terrestris ramosa circa 15-metralis alta (*fide Greenway & Eggeling* 8610) vel epiphytica in arboribus aliis crescens (*fide E. M. Bruce* 769). *Folia* petiolata, digitatim composita, lamina usque ad 14·5 cm. longa et fortasse aequaliter lata vel latiore; petiolus usque ad 18 cm. longus, inferne late dilatatus, superne uniformi sectione 1·5 mm. diam., glaber, leviter sulcatus; foliola (1–)2–5, sessilia vel usque ad 1 cm. petiolulata, forma variabili anguste lanceolata, anguste oblongo-oblanceolata, angustissime elliptica vel angustissime oblongo-elliptica, margine integerrima ad repanda leviter involuta saepe crispa, usque ad 14·5 cm. longa et 3·3 cm. lata, apice longe acuminato, basi attenuata, glabra vel fere glabra, saepe pustulis rotundis parvis usque ad 0·3 mm. diam. utrinque praedita. *Inflorescentiae* paniculatae, terminales, ramulis leviter sulcatis, glabratis, in tres series ab axe principali inflorescentiae dispositis; ramuli primarii (axes racemorum) usque ad 20 et circa 6–20 cm. longi, 1·5–2·6 mm. diam.; bracteae parvae, ovatae, acutae, usque ad 2 mm. longae; ramuli secundarii (pedunculi umbellarum) usque ad 2·7 cm., saepe 1·5–2·5 cm. longi, graciles, 0·4–1·0 mm. diam. in regione apicali ramorum primariorum exsurgentes; ramuli tertiarii (pedicelli) usque ad 7 mm. longi, et 0·2–0·6 mm. diam. *Flores* 10–15 per umbellam; maturi non visi, gemmae ovoideae, usque ad 4·0 mm. longae et 1·2–1·4(–1·6) mm. diam. pedicellis haud articulatis; calyx glaber minutus, 5-dentatus; petala 5, glabra, anguste ovata, acuta, usque ad 2·3 mm. longa et 0·8 mm. lata, nonnihil coriacea; stamina 5, antheris ellipticis, 1·7 mm. longis et 0·6 mm. latis; filamentis brevibus circa 0·7 mm. longis; ovarium biloculare; loculi uniovulati.

(All measurements of floral parts taken from *E. M. Bruce* 769 after boiling in water)

Tanganyika. Morogoro District: Uluguru Mts., Lupanga Peak track, locally dominant on a rocky ridge with *Ocotea usambarensis, Memecylon, Piptadenia, Parinari holstii, Lachnophylis, Albizia gummifera* forest on a steep mountain slope, (young fr.) 16 Aug. 1951, *Greenway & Eggeling* 8610 (EA):—a much branched tree to 12 m. tall with pedate leaves at the end of the branches; leaflets 3–5, linear lanceolate; flowers greenish-white in crowded umbels. Uluguru Mts., Tarana, in forest, (fl.) 4 Feb. 1935, *E. M. Bruce* 769 (K, holo.; BM, iso.):—epiphyte on tree; small green flowers in heads. Uluguru 'Gebirge, Westseite, Lukwangule Hochland, Gebirgssavanne über dem nebelwald', 2400 m., (fl.) 23 Jan. 1933, *Schlieben* 3566 (BM):—10–15 m. high.

Cussonia kirkii *Seem.* in Journ. Bot. **4**, 299 (1866); Hiern in Oliv., Fl. Trop. Afr. **3**, 32 (1877)

C. barteri Seem. in Journ. of Bot. **4**, 299 (1866). Type: Nigeria, Niger River, Borgu, on dry rocky hills, *Barter* 815 (K, holo.)

C. djalonensis A. Chev. in Mem. Soc. Bot. Fr. **2**(8), 38 (1908). Types: French Guinea, Fouta-Djalon, Diaguissa, 1300–1400 m., *Chevalier* 12931, 13548, 13617 (P, syn.) and between Timba and Faranna, *Chevalier* 13309 (P, syn.)

C. nigerica Hutch. in Kew. Bull. **1910**, 136 (1910). Type: Nigeria, Yola Province, Kilba, *Dalziel* 172 (K, holo.)

C. longissima Hutch. & Dalz. in Kew Bull. **1929**, 28 (1929). Type: Ghana, Salaga, *Saunders in Chipp* 805 (K, holo.)

[*C. bancoënsis* sensu Keay in Fl. W. Trop. Afr., ed. 2, **1**, 750 (1956), pro parte, *non* Aubrév. & Pellegr.]

The examination of two recent gatherings of *C. kirkii* made by Milne-Redhead & Taylor in the Songea District of Tanganyika, a much earlier sheet of Busse, possibly from the same District, and conceivably collected quite closely to the former gatherings (and at least, almost certainly from southern Tanganyika), together with a puzzling collection by Anderson from Lindi District, have necessitated a study of this species in relation to *C. barteri* Seem.

I am largely in agreement with the views of Keay (in Fl. W. Trop. Afr., ed. 2, **1**, 750: 1956) regarding the broader specific limits of *C. barteri* there adopted, although I think there are recognisable varieties, as yet undescribed, which do not concern the present Flora. The distribution of the species thus delimited is entirely West African with records from French Guinea, Sierra Leone, Ivory Coast, Ghana, Nigeria and the French Cameroons. Within this taxon I should also include *C. J. Taylor in F.H.* 5449 (Ghana) and *Onochie & Keay in F.H.I.* 19658 (Nigeria) both cited by Keay under *C. bancoënsis* Aubrév. & Pellegr.; with these Keay also cites *Scholes* 454 (Ghana) which on account of its pedicellate flowers, would appear not to fit these species; *Smythe* 267 (an inadequate gathering) is almost certainly from a different family. In my opinion *C. bancoënsis* is not represented at Kew, and the specimens (other than the type) cited in the 'Flora of Tropical West Africa' are referable elsewhere. Leaflet-number*, has in the past been employed (not without some confusion) in the diagnoses of *C. barteri* and *C. kirkii*, but in my opinion this character must now be regarded as not taxonomically significant, at least at the specific level, as must also certain other minor characters of leaflet-morphology originally used for separating the two. The present concept of *C. kirkii* has a discontinuous distribution from West Africa missing almost the whole of East Tropical Africa, presenting itself so far only in the extreme SE. corner of the area of our Flora, and running into Portuguese East Africa where the type locality is Moramballa [now more generally known as Morrumbala], into the Rhodesias and Nyasaland. The specimens represented in the present Flora show con-

* Seemann described *C. barteri* as '5-foliolatis', whereas the leaf on the Kew sheet of Barter's plant clearly possesses 6 leaflets which is the number given by Hiern in the 'Flora of Tropical Africa'. More recently Keay in his key, unfortunately states the leaflet number for this species to be 7–10, which leads to the unintentional exclusion of *Barter* 815 and *Saunders in Chipp* 805 (the latter having 5 leaflets).

siderable variation. Of the gatherings studied, two accord well with the above conception of the species, whilst the other two show disconnected variation in characters not so far encountered. At present we lack sufficient material to see how the variants fit into the picture of the species as a whole; they are treated here as varieties.

var. **quadripetala** *Tennant*, var. nov., a var. *kirkii* spicis corollis et androeciis persaepe vel semper tetrameris differt.

Tanganyika. Songea District: about 32 km. E. of Songea by R. Mkurira, in riverine forest, 930 m., 19 Jan. 1956, *Milne-Redhead & Taylor* 8274 (K, holotypus varietatis). Not known elsewhere.

var. **bracteata** *Tennant*, var. nov., a var. *kirkii* inferne bracteis multis sterilibus imbricatis quam ceteris fertilibus majoribus praeditis differt.

Tanganyika. Lindi District: Namanga [nr. Ruponda], on red acid clay, 490 m., 1 Jan. 1949, *Anderson* 284 (EA, holotypus). Not known elsewhere.

Cussonia holstii [*Harms ex*] *Engl.* in Abh. Preuss. Akad. Wiss. **1894**, 64 (1894); Engl., Pflanzenw. Ost-Afr. **C**, 298 (1895); Lebrun in Bull. Jard. Bot. Brux. **13**, 17 (1934); Battiscombe, Trees and Shrubs of Kenya Col., ed. 2, 115 (1936); Robyns, Fl. Sperm. Parc Nat. Alb. **1**, 691 (1948); Brenan & Greenway, Check-Lists For. Trees and Shrubs Brit. Emp. **5**(2) (Tanganyika Territory) 59 (1949); Eggeling, Indig. Trees of Uganda Prot., ed. 2, 34 (1952).

C. boranensis Cufodontis in Miss. Biol. Borana, Racc. Bot., Angiosp.-Gymnosp. 149, fig. 42 (1939). Type: SE. Ethiopia: Arero (Meta Gafersa), 'entro e nei pressi della cinta', 1800 m., *Cufondontis* 284 (FI, holo.), not seen, but description and figure of foliage very closely agree with other gatherings from Ethiopia.

The holotype of *C. holstii* was destroyed at Berlin, and no isotype has been traced; only one specimen has been seen from the Usambara Mts., where the type-locality, Mbindi, is said to be, but this place has not been found on any of the maps examined. Holst worked at Mlalo for some time, and many gatherings were collected by him in this locality during 1891–2 and it is possible that the present specimen figured amongst them, since the vegetational zone in which Engler (loc. cit. supra) includes the species, 'Gebirgsbuschwald 1200–1700 m.', although embracing a large area of the upper mountain slopes, does include Mlalo, which is situated at 1460 m. It is also just possible that Mbindi should read Mtindi, the latter being a kilometer or so west of Malindi. The land here is rather higher than at Mlalo (1800–1900 m.), and if strict limits of altitude can be observed in Engler's classification of altitudinal habitats, Mtindi would probably not be the type-locality since it falls within 'Der Hochgebirgswald uber 1700 m.' The original description of the species has nothing to suggest that Holst's plant was atypical of the numerous and homogeneous collections since gathered from Uganda, Kenya, Tanganyika, Belgian Congo, Somaliland and Ethiopia. *Buchwald* 165 (the only specimen I have seen from the Usambara Mts.: received at Kew 1902) is unfortunately lacking in foliage, but it is typical in the characters of the spike. Certain more recently collected variants from Tanganyika would in all probability, not be better typified by the Holst specimen, since they were not collected in the Usambara

Mts., and the characters in which they are atypical are quite distinct. The original and subsequent descriptions of the species do not mention the characters of the spike in which the variants differ from the remainder of the material. The designation of a neotype for the species is delayed until it is seen what certain collectors who are now, or shortly will be, in the vicinity of Mlalo looking for the species, have been able to obtain.

var. **holstii**

Axis spicarum puberulus ad pubescens; bracteae flores gerentes circa 1 mm. longae et basi 1 mm. latae, squamosae, fere glabratae, apicibus obtusis ad acutis. *Fructus* 4–5½ mm. longi, vix costati in statu sicco, urceolati, sub stylopodio manifeste convexi; rami styli in fructibus maturis usque ad 0·5 mm. longi, raro late divergentes.

var. **tomentosa** *Tennant*, var. nov., a var. *holstii* axibus spicarum tomentosis differt.

Bracteae flores gerentes usque ad 2 mm. longae, apiculatae, pubescentes ad tomentosae. *Fructus* 5–6 mm. longi, leviter costati saltem in statu sicco, urceolati, sub stylopodio haud manifeste convexi.

forma **tomentosa**

Foliola marginibus serratis ad crenatis. *Rami styli* in fructibus maturis circa 1 mm. longi, graciles, saepe late divergentes.

TANGANYIKA. Singida District: Manyoni Copje, local among great granite rocks, 1300 m., (fr.) 21 Nov. 1931, *B. D. Burtt* 3418:—tall tree to 13 m. and over; bark heavily reticulate; bole 1 m. in diam. at 2 m.; and Rift Wall near Maw Hills, frequent locally on rock-outcrop with large trees of *Brachystegia microphylla*, 1700 m., (fr.) Oct. 1935, *B. D. Burtt* 5230:—'candelabra-branched' small tree 3–4·5 m. high; vernacular name 'Ngunguti' (Iramba). Kondoa District: Simbo Hills, *Brachystegia* zone, 1380–1540 m., (fr.) 14 Dec. 1927, *B. D. Burtt* 806 (K, holotypus varietatis; EA, isotypus):—a tree to 9 m. high; bark very fibrous and used for cord by Africans; vernacular name 'Samaa' (Sandawi).

forma **integrifoliola** *Tennant*, forma nov.

Foliola marginibus fere integerrimis. *Rami styli* in fructibus maturis usque ad 0·5 mm. longis.

TANGANYIKA. Shinyanga District: Usanda; *Kortitschoner* 1850 (K, holotypus formae; EA, isotypus):—root decoction used for stomach-ache; vernacular name 'Mgagigai'.

I wish to record my thanks to colleagues in the African Section for helpful discussion and in particular to Mr. J. P. M. Brenan for his help and advice. I am obliged to Mr. N. Y. Sandwith for various corrections in the latin of the diagnoses.

Cercospora and allied genera.*—The scope of the paper is sufficiently indicated by the title. Two new and four old species are recognised and described on *Phyllanthus* spp. in Africa and elsewhere. Notes are also given on two species found on allied host genera in Asia, viz. on *Breynia* in India and on *Securinega* in Japan.

R. W. G. DENNIS

* *Studies on Cercospora and allied genera. I.* Mycological Papers No. 72. Cercospora species with coloured spores on Phyllanthus (Euphorbiaceae). By F. C. Deighton. Pp. 23. Kew: Commonwealth Mycological Institute, 1959. Price 9/-.

Nomenclatural notes: XIV*

A. A. Bullock

LECTOTYPES OF SOME GENERIC NAMES

Ellipeiopsis *R. E. Fries*, Arkiv Bot. ser. 2. 3: 41. May 1955† (*Annonaceae*).

Fries included two species, apparently overlooking the fact that Airy-Shaw (1939) had regarded them as conspecific (Kew Bull. 1939: 279, *adnot.*) They are *Uvaria ferruginea* Buch.-Ham. ex Hook.f. et Thoms.—which Airy-Shaw transferred to *Uvariella*—and *Ellipeia cherrevensis* Pierre ex Fin. et Gagnep. In these circumstances, and in view of the fact that Fries' protologue gives no indication of a type, the following choice is made:—

Ellipeiopsis ferruginea (*Buchanan-Hamilton ex Hooker f. et Thomson*) *R. E. Fries*, *l.c.*—Lectotypus nominis generici.

Uvaria ferruginea Buchanan-Hamilton ex Hooker f. et Thomson, Fl. Ind. 1: 96. 1855.

Ellipeia ferruginea (Buchanan-Hamilton ex Hooker f. et Thomson) Hooker f. et Thomson in Hooker f., Fl. Brit. Ind. 1: 52. 1872.

Uvariella ferruginea (Buchanan-Hamilton ex Hooker f. et Thomson) Airy-Shaw, Kew Bull. 1939: 279. 1939 (adnot.).

Rauwenhoffia *Scheffer*, Ann. Jard. Bot. Buitenzorg, 2: 21. 1885 (*Annonaceae*).

Scheffer referred two species to this genus,—*R. siamensis* Scheffer and *R. uvarioides* Scheffer. Of these, the first was known to him from a plant cultivated in the botanic garden at Bogor, the second only from a dried specimen collected by Beccari on the island of Lutor. The former is therefore chosen as lectotype of the generic name:—

R. siamensis *Scheffer*, *l.c.*—Lectotypus nominis generici.

Lophiocarpus *Miquel*, Ill. Fl. Arch. Ind. 50. 1870 (*nom. illeg.*, non Turczaninow, 1843) (*Alismataceae*).

The name *Lophiocarpus* was coined by Kunth, who used it (Enum. Pl. 3: 161. 1841) as a sectional epithet under *Sagittaria* Linn. In the section, Kunth enumerated *S. cordifolia* Roxb., *S. guayanensis* Kunth and, doubtfully, *S. lappula* Don. The type of the section is clearly one of the first two species, but there is nothing in the description of the section to indicate one or the other.

Miquel adopted Kunth's sectional epithet as a generic name, unfortunately overlooking the fact that Turczaninow had described a genus *Lophiocarpus* (*Chenopodiaceae*) in 1843, and he listed two species, *L. lappula* (Don) Miquel and *L. cordifolia* (Roxb.) Miquel, both of which occurred in the area with which he was concerned, whilst he thought that *Sagittaria guayanensis* Kunth did not. At first sight it would appear the *Sagittaria cordifolia* Roxb. should be chosen as type of the generic name, but it is in this case more convenient to rely upon the nomenclatural synonymy with *Sagittaria* sect. *Lophiocarpus* Kunth.

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* Continued from Kew Bull. **14** : 62. 1959.

† The method of citation is that used in 'Index Nonimum Genericorum'.—Ed.

It was pointed out by Micheli (1881) that *S. cordifolia* Roxb. and *S. guayanensis* Kunth are taxonomic synonyms, and since the latter bears the older epithet its choice as lectotype of the generic name *Lophiocarpus* Miq. non Turcz. and therefore also of the legitimate name for this genus, *Lophotocarpus* (see below) is automatic.

L. guayanensis (*Kunth*) *Micheli* in DC. Monogr. Phan. 3: 60. 1881.—Lectotypus nominis generici.

*Sagittaria guayanensis** Kunth, Nov. Gen. et Sp. 1: 250. May 1816.

S. cordifolia Roxburgh, Fl. Ind. 3: 647. 1832.—Kunth, Enum. Pl. 3: 161. 1841.

Lophotocarpus *T. Durand*, Ind. Gen. Phan. p. x et 627 (ind.). 1888 (*Alismataceae*).

This is the legitimate name for *Lophiocarpus* Miq. non Turcz., the type-species of which is given above. The generic name was added to Durand's text in a list of new names evidently compiled after the body of the work was printed, and so also appears in the index (see below under *Michelia*).

L. guayanensis (*Kunth*) *Morong et J. G. Smith*, Mem. Torrey Bot. Club 5: 25. 1894.—Lectotypus nominis generici.

Sagittaria guayanensis Kunth, Nov. Gen. et Sp. 1: 250. May 1816.

Michelia *T. Durand*, Ind. Gen. Phan. 504. 1888 (*nom. illeg.*, non Linnaeus, 1753) (*Alismataceae*).

This is a good example of a *nomen abortivum*. Having observed that *Lophiocarpus* Miquel (1870) is a later homonym, Durand coined the new name *Michelia* for it, failing at first to recognise that this also is a later homonym. At a late stage in the production of his *Index*, however, the legitimate name *Lophotocarpus* (see above) was substituted for it. The type of *Michelia* Durand, non Linn. is *Sagittaria guayanensis* Kunth.

Diclidanthera *Martius*, Nov. Gen. et Sp. 2: 139. *tt. 196–7.* 1827 (*Diclidantheraceae*).

This genus is the type of the family name *Diclidantheraceae* and in Taxon 8: 169. 1959, *D. laurifolia* Martius was cited as type of the generic name. The choice was somewhat arbitrary, but of the two species known to Martius (the other was *D. pendulifolia*) it was the only one of which he knew the fruit. The generic *character differentialis* included fruit characters and thus led to the stated choice.

D. laurifolia *Martius*, *l.c.* 141. *t. 196.*–Lectotypus nominis generici, vide Bullock, Taxon 8: 169. 1959.

Sarcosperma *Hooker f.* in Bentham et Hooker f., Gen. Pl. 2: 655. 1876 (*Sarcospermataceae*).

Hooker referred three species to his new genus, but there is nothing in the protologue to indicate which should be chosen as lectotype of the generic name. The following is therefore an arbitrary selection of what is perhaps the best known of the three species.

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* The original spelling. In his *Enum. Pl.* (1841), Kunth adopted the more familiar '*guyanensis*'.

A basionym, *Sideroxylon arboreum* Buch.-Ham. is sometimes cited, but this is a manuscript name given by Hooker (*l.c.*) in synonymy, and also by C. B. Clarke, who provided the first valid publication of the specific epithet.

S. arboreum *C. B. Clarke* in Hooker f., Fl. Brit. India 3: 536. 1882. Lectotypus nominis generici, vide Bullock, Taxon 8: 198. 1959.

Kadua *Chamisso et Schlechtendal*, Linnaea 4: 157. 1829 (*Rubiaceae*).

In these notes (VI. Kew Bull. 13: 97. 1958), I selected *K. cookiana* as lectotype of the generic name, having overlooked Fosberg's paper* 'The Polynesian species of *Hedyotis*' (Bernice P. Bishop Museum Bull. No. 174. 1943) in which he regarded *Kadua* as a subgenus of *Hedyotis*.

Fosberg quoted (*l.c.* 69) *Hedyotis* sect. *Kadua* Endl. (1841), *Kadua* sect. *Eukadua* Kuntze (1904), *partim* and *Kadua* sect. *Tetrakadua* Kuntze (1904), *partim* as synonyms and was thereby enabled to exclude four of the original five species of *Kadua* from the subgenus, leaving *K. acuminata* Cham. et Schlecht. as the implied lectotype of the subgeneric name *Hedyotis* subgen. *Kadua* Fosberg. According to Fosberg's treatment, *K. cookiana* is to be placed in *Hedyotis* subgen. *Polynesiotis* Fosberg sect. *Wiegmannia* Fosberg. The epithet *Wiegmannia* is derived from the generic name *Wiegmannia* Meyen (Reise 2: 139. 1835), which was based upon *W. glauca* Meyen (*Hedyotis schlechtendaliana* Steudel).

It is, therefore, necessary to withdraw my choice of *K. cookiana* as lectotype of the generic name *Kadua* and to cite instead *K. acuminata*, as follows:—

K. acuminata *Chamisso et Schlechtendal*, *l.c.* 163.–Lectotypus nominis generici; vide Fosberg, Bernice P. Bishop Mus. Bull. No. 174: 69. 1943 (sub *Hedyotis* subgen. *Kadua*).

THE FAMILY NAME STILBACEAE

The generic name *Stilbum* Fries (1821), typified by *S. vulgare* Fries (*vide* Donk, Taxon 7: 244. 1958), was associated also with certain species of *Fungi Imperfecti* which are now referred to the genus *Stilbella* Lindau. That Fries had *S. vulgare* chiefly in mind when he adopted the generic name is shown by the fact that he referred the genus to the *Gasteromycetes* when he described for it the family *Stilbaceae* ('*Stilboidei*'; Syst. Myc. 1: XLII, XLVII. 1821). It is clear that the family name *Stilbaceae* Fries must be permanently attached to the genus *Stilbum* Fries, although some mycologists have allowed it to become attached to the genus *Stilbella* Lindau, a procedure which is not permissible under the Code.

The position is further complicated because *Stilbum* Fries is now referred to another family which, by the strict application of the Code, would require to change its name, whilst the phanerogamic family *Stilbaceae* (Kunth, 1831; '*Stilbineae*') would also require a new name. The only synonym of *Stilbe* Bergius (1767) available for the formation of such a new name is *Luehea* F. W. Schmidt (1793; non Willd. 1801), a rejected earlier homonym.

* I am greatly indebted to Dr. Fosberg (*in litt.*) for drawing my attention to this paper.—A.A.B.

In these circumstances it seems reasonable to propose the conservation of the later homonym *Stilbaceae** Kunth (Handb. Bot. 393. 1831.—'*Stilbineae*'), based upon *Stilbe* Bergius, and the rejection of *Stilbaceae* Fries (Syst. Myc. 1: XLII, XLVII. 1821.—'*Stilboidei*'), based upon *Stilbum* Fries.

Orchids of Venezuela.**—The national flower of Venezuela is an orchid, *Cattleya mossiae*, and at least 1,000 species of this family occur in the republic. The artist author, Mr. Dunsterville, began to collect and draw Venezuelan orchids some seven years ago and, most happily, 'the thought of publication grew more insistent until it has finally resulted in this volume', which is the first flowering of a project designed to illustrate all the species. Mr. Leslie Garay, Curator of the Oakes Ames Orchid Herbarium at Harvard University, has joined the author, helping him with identifications and, no doubt, with the preparation of descriptions.

This book, which will delight professionals as much as amateurs, illustrates 200 species in 67 genera, the arrangement being alphabetical: in each instance the right hand page shows Mr. Dunsterville's superb drawing with analyses of flowers, while on the left is the description, with synonymy and distribution outside Venezuela. There is an exceptionally useful short introduction (by Mr. Garay) discussing morphology and taxonomic characters, and a lengthy and cogent warning about variability within species which may come as a surprise to beginners and amateurs. This warning extends to each page of the text, where it is noted that the dimensions given in the description refer only to plants handled by the authors. The date 1928 given (p. 22) for the first report, by M. Pouyanne, of the phenomenon of pseudo-copulation appears to be incorrect, see M. J. Godfery in Journ. Bot. **59**, 286 (1921) and Oakes Ames, 'Orchids in Retrospect', 88 (1948), who both refer to the 'Journal de la Société Nationale d'Horticulture de France' for February–March, 1916. Again, the insect depicted as *Scolia* (Dielis) *Ciliata* Fabr. in Fig. 6 corresponds with ill. 1, *Andrena nigroaenea* Kirby, on p. 96 of Oakes Ames's 'Orchids in Retrospect', and not with ill. 1, *Scolia ciliata*, on p. 91.

Mr. Dunsterville has travelled in many regions of Venezuela, especially within week-end distance of Caracas and on the wonderful Gran Sabana; as he explains in his brief geographical notes, he still has to explore the Western Andes and a good deal of the far interior. We hope he will do so and complete his series, of which this admirable volume with its handsome wrapper in colours of white, dove-grey and tomato, is the forerunner.

N. Y. Sandwith

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* It has been pointed out by Dr. G. Buchheim (*in litt.*) of Berlin-Dahlem, that there can be no justification for the spelling *Stilbeaceae* suggested by me in Taxon 7: 32 (1958) in order to avoid the homonymy established in this note.—A.A.B.

** *Venezuelan Orchids Illustrated.* Volume 1. By G. C. K. Dunsterville and L. A. Garay. Pp. 448, 16 colour photographs (4 plates), 200 line drawings, 6 text figures, 2 maps. London, André Deutsch Ltd., 1959. Price 5 guineas; $15.

Studies in the *Ericales*: XIII*

H. K. Airy Shaw

A NEW AGAPETES FROM THE SHAN STATES OF BURMA

Agapetes inopinata *Airy Shaw*, sp. nov., e Seriei *Longifilium*, Subser. *Racemosarum* (cf. Kew Bull. **13**, 501–503: 1959); *A. pottingeri* Prain et *A. adenobotryi* A.S. affinis, a priore foliis 4–5 cm. tantum longis breviter acuminatis subsessilibus racemis subterminalibus plurifloris floribus cernuis subsecundis calyce parvo 2–3 mm. tantum longo, a posteriore foliis manifestius nervosis pedicellis 6–7 mm. tantum longis (ideoque racemo haud corymboso), bene distincta.

Frutex ut videtur epiphyticus. *Ramuli* recti, rigidi, usque 4 mm. crassi, foliosi, dense fusco-setulosi setulis primo glandulosis. *Folia* oblongo-ovata usque lanceolata, 3·5–5 cm. longa, 1·3–2·1 cm. lata, basi rotundata (raro levissime cordata), sursum sensim angustata, brevius vel longius acuminata, ipso apice acutissima, margine integerrima, leviter incurva, glaberrima, chartaceo-coriacea, siccitate supra fusco-brunnea subtus pallide viridi-brunnescentia, costa gracili supra in sulco argute prominente subtus etiam prominente, nervis lateralibus supra leviter bullato-insculptis, subtus obscuriuscule prominulis, petiolo subnullo. *Racemi* ex axillis terminalibus et subterminalibus exorti, 2–4 cm. longi, erecti, stricti, 4–6-flori, dense glandulosi. *Bracteae* subulatae, 4–5 mm. longae, 1 mm. latae, recurvae, glandulosae, brunnescentes; bracteolae similes sed duplo minores, ad basin pedicelli sitae. *Pedicelli* subsecundi, cernui, 6–7 mm. longi, dense glandulosi. *Receptaculum* parvum, globosum, 1–1·5 mm. diametro, densissime glanduloso-setosum. *Calyx* cupularis, 3 mm. longus, extra glandulosus, tubo 2 mm. longo, dentibus deltoïdeis acutis 1 mm. longis. *Corolla* cylindrica, 8–10 mm. longa, 3–5 mm. diametro, inferne angustata, breviter glanduloso-puberula, miniata; lobis parvis deltoïdeis 1 mm. longis reflexis viridibus. *Filamenta* 3 mm. longa, linearia, glabra. *Antherae* 4–5 mm. longae, dorso bicalcaratae, inter thecas (2 mm. longas) et rostra (2·5 mm. longa) leviter geniculatae, rostris ut videtur coniformiter conniventibus. *Stylus* 8–9 mm. longus, glaber, stigmate punctiformi. *Fructus* ignotus.

Burma. Southern Shan States. Loimwe, 1500–1800 m., 2 April 1929, *F. Kingdon Ward* 8788 (Herb. Chicago Mus., dupl. in Herb. Stockholm): 'A bushy epiphyte in the forest, but in full light. Stems swollen. Hairs of the inflorescence colourless, with red glands at the tip. Flowers scarlet, corolla teeth green.'

I have named this species *inopinata* because, after having, as I thought, dealt with all outstanding *Agapetes* material collected by Kingdon Ward, I was unexpectedly presented, through the good offices of Dr. H. Sleumer, with the above comparatively early gathering of Ward's from the Southern Shan States of Burma. It was collected by Ward on his way through Burma to join the Roosevelt Expedition to Indo-China in 1929. The route lay more or less due West to East, from Thazi, *via* Kalaw, Taunggyi, Loilem, Kengtung, Loimwe, Möng Nawng, the Nam Lwe River, and Möng Yawng, to

* Continued from Kew Bull. **14**, 113 (1960)

the frontier on the Mekong. An account of the Burmese section of the journey can be found in the Gardener's Chronicle, vols. **88** and **89** (1930–31), *passim*; and a description of the country around Loimwe, with a specific reference to this scarlet-flowered *Agapetes* with its glandular inflorescence, will be found in *l.c.* **88**, 514 (Dec. 1930).

The species clearly belongs in the Subseries *Racemosae*, and its short corolla-lobes bring it nearest to *A. pottingeri* and *A. adenobotrys*, from which it differs in the characters mentioned in the diagnosis.

I am indebted to the Director of the Chicago Natural History Museum for the loan of Kingdon Ward's original specimen.

Mist propagation.*—In spite of the amount of experimental work carried out and the wide range of plant material used, mist propagation is still in its infancy, and much remains to be done before it can replace, entirely, conventional methods of cutting propagation.

Nevertheless, the author of this digest has rendered a great service in compiling under one cover, a mass of information on this method of propagation; the range of equipment and structures, etc.

In her introduction Miss Rowe-Dutton explains the working principles of the 'Technique of Mist' and its known advantages over conventional methods of cutting propagation under glass.

Under headings and sub-headings the various mist control systems used in the U.S.A., Holland, and the United Kingdom, are fully discussed and the working of each explained. In addition to photographic illustrations of control systems, diagrams of electrical circuits are also given.

There is valuable information, again supported by excellent photographic reproductions, of various mist propagation structures, including out-door mists and lightweight plastic tents that are apparently in quite extensive use in the U.S.A.

The importance of rooting media, which to date has been variable, is mentioned, but not discussed at any length, although the various mediums tested are listed and commented on.

Such important factors as soil warming, leaching and nutrition, hormone treatment of cuttings, are covered and all available information given.

Of special value to everyone engaged on mist propagation, will be the classified tables of results that have been achieved with a wide range of soft and hard wooded plants. These being arranged alphabetically to afford easy reference.

This digest will be welcomed by all who are interested in or engaged in the fascinating art of plant propagation, for it makes available particularly to the student, information otherwise unobtainable.

S. A. Pearce

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* *Mist propagation of cuttings*. By Patricia Rowe-Dutton. Pp. iv + 135, 42 figures (half-tone and line-drawings). Farnham Royal: Commonwealth Agricultural Bureaux, 1959. Price 10/-.

The identity of *Saracha acutifolia* Miers

N. Y. Sandwith

Saracha acutifolia was described by Miers (1) from a single holotype specimen, *Dr. Coulter* No. 593, in Hooker's herbarium now at Kew. The species has since then remained without a definite published interpretation. It was referred, at first doubtfully, later with probability, to *Chamaesaracha coronopus* (Dun.) A. Gr. by A. Gray. (2, 3, 4), and this questionable assignment was repeated by Rydberg (5) in his revision of North American species of *Physalis* and related genera. I have seen no further mention of Miers's species, or of Gray's proposed identification of it, in modern floras of either California or Arizona, although Gray had suggested that Coulter's plant was probably collected in Arizona. It was completely ignored by G. Bitter when he wrote his four papers on the genus *Saracha*, published in Fedde's 'Repertorium', vols. 17–20.

Recently this species came to my notice when Dr. J. G. Dony was attempting to match at Kew a Solanaceous wool-alien which he had collected at Flitwick, Bedfordshire, and the specimen which seemed nearest to his plant was the holotype of *Saracha acutifolia*. He left his material with me to investigate further and I found, after looking at several related genera and, in particular, the genus *Physalis*, the North American covers of which were in serious need of revision, that his plant was undoubtedly the very distinct species *Physalis wrightii* A. Gr. (6) which is said (7) to be a common weed of cultivated land in southern Arizona and also occurs in southern California, western Texas, south-western New Mexico and northern Mexico. Kew material of this species was scanty and there was no isotype, but a loan of the type (*Wright* 1602) and two other representative sheets from the Gray Herbarium has amply confirmed the identity, not only of Dr. Dony's specimen, but also of the holotype of Miers's *Saracha acutifolia*.

Of course, Miers's epithet is much earlier than Gray's and is unfortunately not preoccupied in *Physalis*, and it seems deplorable to take advantage of this discovery and to reduce the well-known name *P. wrightii* into the synonymy of a new combination. The holotype of *Saracha acutifolia* is, in Miers's words, not more than 4 inches in length and 'probably only a fragment'. It is, in fact, the top of a stem or branch, with leaves, several buds, a single good corolla laid on its face, and no fruits: badly pressed, in such a way that some of the peduncles are tangled together or overlaid by leaves. Then, Miers's description, which everyone will read, is seriously inaccurate. The words 'pedunculo sub 2-floro' and 'the peduncle and pedicels together measure about half an inch' are untrue and wholly misleading, since the flowers are solitary in the axils of the leaves, with the simple, long and slender peduncles of *Physalis wrightii*. This character alone excludes the specimen from *Saracha*, which it does not resemble. The description of the corolla as 'intus imo maculata' might lead the reader to assume the presence of the purple spots at the throat seen in some species of *Physalis*, but the single expanded corolla of the specimen was obviously wholly white or pale yellow, as in *P. wrightii*, and its base has dried only a very pale brown. The calyx is described as 'hirsutulo', but the pubescence is of the characteristic

very short, adpressed, almost papillose kind seen in *P. wrightii*; whereas *Chamaesaracha coronopus*, with which Gray associated Miers's species, has a completely different indumentum of short 'dendroid' hairs often accompanied, especially on the peduncles and calyces, by spreading, unequal, gland-tipped trichomes. Thus this wretched holotype specimen does not even agree with the author's description, although he compiled that description from it alone, and there has resulted a dubious misinterpretation of the species by botanists who read that description and could not compare it with the specimen. The reasonable course would seem to be to ignore Miers's name *Saracha acutifolia*.

Unfortunately, the International Code does not permit this, nor can I save the situation in *Physalis* by using the epithet *acutifolia* in advance for some other purpose. No accepted specific name seems to be a later homonym, and who would be so irresponsible as to describe a new species of this particular genus of weeds from any other motive than that of a serious and critical investigation? Besides, a request for information from the School of Botany, Trinity College, Dublin, where Thomas Coulter (1793–1843) was Keeper of the Herbarium in which the best set of his specimens is preserved, has produced the loan of duplicate material of the type-collection which is much better than the holotype and agrees even more evidently with *Physalis wrightii*, consisting of two apical portions of branches, each of them bigger and better pressed than the piece which Miers saw (both are more than 5 inches long, and both show the inner surface of an expanded corolla).

One must follow the Code, however much one may deplore its emphasis on concrete typification in an instance such as this, and I therefore submit the following new combination, if only to forestall what will certainly be done by someone else:

Physalis acutifolia (*Miers*) *Sandwith*, comb. nov.

Saracha acutifolia Miers in Ann. & Mag. Nat. Hist., ser. 2, **3**, 449 (1849) and Illustr. S. Amer. Pl. **2**, 19 (1857); A.DC. in DC., Prodr. **13**(1), 684 (1852)

Physalis wrightii A. Gr. in Proc. Amer. Acad. **10**, 63 (1875)

In conclusion, it is worth noting that N. E. Brown wrote on the sheet of Miers's holotype, 'Seems to be a Physalis'; G. Bitter wrote on it, 'Physalis. The name of the species I shall send later [but apparently never did]'; Bentham wrote, 'Videtur Physalis', at the side of the description of *Saracha acutifolia* in his copy of the second volume of Miers's 'Illustrations'; and the Index Kewensis added to its citation the comment in parenthesis, 'Physalidis sp.?'. It is not surprising, however, that no mention of the species is made in Waterfall's recent taxonomic study of the genus *Physalis* in North America north of Mexico (8).

References

1. Miers, J. G. Annals and Magazine of Natural History, ser. 2, **3**, 449 (1849); Illustrations of South American Plants **2**, 19 (1857)
2. Gray, A. Proceedings of the American Academy of Arts and Sciences **10**, 62 (1875)
3. Gray, A. Botany of California **1**, 540 (1876)
4. Gray, A. Synoptical Flora of North America **2**, pt. 1, 232 (1878)

5. Rydberg, P. A. Memoirs of Torrey Botanical Club **4**, No. 5, 370 (1896)
6. Gray, A. Proceedings of the American Academy of Arts and Sciences **10**, 63 (1875)
7. Kearney, T. H. & Peebles, R. H. Arizona Flora 754 (1951)
8. Waterfall, U. T. Rhodora **60**, Nos. 712–714 (1958)

Linnaeus's 'Species Plantarum'.*—The fundamental nature of the 'Species Plantarum' in relation to plant nomenclature has been realized for more than 150 years, but few botanists have been aware of its real significance or of the magnitude of Linnaeus's achievement.

With the publication of a new facsimile of the original 1753 edition, the Ray Society has been able to publish an Introduction, by W. T. Stearn, which explains much which was obscure or but dimly seen, and provides students with the means by which they may read intelligently, not only the 'Species Plantarum' itself, but a great number of other Linnaean, pre-Linnaean and post-Linnaean works. Dr. Stearn is to be congratulated, not only upon his scholarship, but upon his energy in producing an extremely valuable reference source to nearly all that has been written about Linnaeus as a man and botanist and about the sources of the 'Species Plantarum'. His introduction gives all that can be desired, from details of Linnaeus's private life to the whereabouts of the specimens which formed the basis of the 'Species Plantarum' and instructions for the typification of the plant names in it.

The Introduction includes a section giving a chronological list of 'Major Botanical Publications of Linnaeus' and one explaining the Linnean sexual system. There follows an account of the 'Genera Plantarum', and method of typification of the genera described therein. It is to be hoped that the principles enunciated will become standard practice. They are amplified in a section on the 'Hortus Cliffortianus' and one on the 'Amoenitates academicae, and the authorship of Linnean dissertations; the latter are listed in chronological order. There follows a survey of the history, sources, etc., of the text of the 'Species Plantarum' which includes an essay on the introduction of binomial nomenclature and an account of the reception of the work in England.

The working methods adopted by Linnaeus—which partly explain how he was able to carry out such an immense undertaking—the earlier works regularly consulted by him and the herbaria available to him are all discussed and provide students, in a few pages, with information which must have occupied Dr. Stearn many years in accumulating.

The typification of Linnaean species is admirably discussed in section XIII and there is a bibliography of relevant literature. A number of current but false ideas concerning the specimens in the Linnean herbarium are here

* *Species Plantarum.* By Carl Linnaeus. A facsimile of the first edition (1753). Vol. I, with an Introduction by W. T. Stearn. Pp. xiv + 176 + (xiv + 560, facsimile) + (6, index). London: Ray Society, 1957. Price 50/-. Vol. II, with an Appendix by J. L. Heller and W. T. Stearn. Pp. xv + (561–1231, facsimile) + 148. London: Ray Society, 1959. Price 60/-.

finally exploded, and the importance of the protologue as a whole is pointed out.

The various editions of the 'Species Plantarum'—and particularly the relationship of the second edition (1762) to the first—are discussed in section XIV, and there also are facsimiles of the cancelled pages (75, 89, 90, 259, 260) which nevertheless are still to be found in some copies of the original first edition.

The geographical (Latin) names used by Linnaeus are frequently obscure; Dr. Stearn discusses them and provides an alphabetical list of them with their modern English equivalents in section XV. Section XVI is concerned with the preface and dedication and a full translation of both is of no little interest.

Stearn also discusses (Sect. XVII) at some length Linnaeus's concept of species and gives an account (Sect. XVIII) of the cryptic signs used by him.

Whilst each section is accompanied by its own special bibliography, section XIX is entitled 'General Bibliography' and the Introduction concludes with a very full index. Following the facsimile of volume 1 there is an index to the genera and classes, with references also to the fifth edition of the 'Genera Plantarum'.

At the beginning of volume 2 there is a preface, *addenda* and *corrigenda* to the Introduction. The facsimile is followed by an Appendix which includes a most valuable 'Index auctorum et liborum a Linnaeo (Species Plantarum, 1753) citatorum', most painstakingly compiled by J. L. Heller. This will enable students to identify the very obscure bibliographical abbreviations employed by Linnaeus.

The Appendix also includes notes by Stearn on the illustrations in both volumes and accounts of four supplementary volumes by Linnaeus—'Methodus' (1736), 'Demonstrationes Plantarum' (1753), 'Genera Plantarum' (1754) and 'Ordines Naturales' (1764). There is also an index to the Appendix and a general index to the 'Species Plantarum' as a whole. This last contains an ingenious system of references to the literature concerning lectotypification of generic names.

Everyone concerned in the production of these two volumes is to be heartily congratulated. It will be recalled that the original edition was set up in very worn type and there were numerous imperfections; the facsimile is certainly no worse than the original and may be even better because it is printed on good quality smooth paper. The printing of the Introduction and Appendix leaves little to be desired; the few errors in the Introduction are corrected at pp. xiii–xv of the second volume, but it is fair to say that none of them would have led to ambiguity or error.

The dedication to the late Dr. T. A. Sprague and Dr. H. K. Svenson 'for their work as plant taxonomists no less than as students of Linnaean method and nomenclature' is indeed well-chosen.

The Ray Society has in the past produced many fine volumes; this is perhaps its first venture in this particular field and it is to be hoped that more volumes of the same kind will follow. At five pounds ten shillings sterling the two volumes make better value for money than a great many, more ephemeral, scientific books.

A. A. Bullock

Notes on tropical African *Aïzoaceae*

C. Jeffrey

The following notes are occasioned by the preparation of an account of this family for the 'Flora of Tropical East Africa'.

Gisekia pharnaceoïdes *L.* var. **pseudopaniculata** *Jeffrey*, var. nov. a typo floribus minoribus in cymas umbelliformes paucifloras laxas dispositis et pedicellis pedunculisque filiformibus differt.

Typus varietatis: Kenya, Northern Frontier Province, Dandu, 5 May 1952, *Gillett* 13041!. Holotypus in Herb. Kew. (K).

Limeum praetermissum *Jeffrey*, sp. nov. ex affinitate *L. dinteri* Schellenb. a quo sepalis acuminatis staminibus 5 et mericarpiis plerumque laevibus differt.

Planta perennis. *Rami* 40 cm. longi, procumbentes, herbacei, ut folia inflorescentiaeque pilis glandulosis viscidis densiuscule obtecti, demum glabri, sublignosi, albidocorticati. *Folia* alterna, petiolata; lamina 15–26 mm. longa, 7–12 mm. lata, carnosula, obovata, elliptica vel oblanceolata, basi angustata, apice rotundata vel breviter retusa; petiolus brevis, ad basin margine membranaceo-dilatatus, 2–4 mm. longus. *Stipulae* nullae. *Inflorescentiae* oppositifoliae, cymosae, laxiramosae, 15–35-florae, 60–100 mm. longae. *Bracteae et bracteoli* parvi, anguste lanceolati, margine albido-membranacei, apice acuminati. *Pedunculi* 36–66 mm. longi, racemosi. *Pedicelli* 2–6 mm. longi. *Sepala* 5–6 mm. longa, 2–3 mm. lata, libera, ovata, extra dense glandulosa, herbacea, margine albido-membranacea, apice longiuscule acuminata, acumine saepissime recurvato. *Staminodia* nulla. *Stamina* 5, libera; filamenta ovata, acuminata, basi late dilatata, glabra. *Ovarium* biloculare, superum, bicarpellatum; stylus brevis, filiformis; stigmata 2, suberecta, linearia. *Fructus* in mericarpia 2 secedens; mericarpia hemisphaerico-reniformia, 2·1 mm. lata, 3 mm. alta, indehiscentia, exalata, facie superiore plerumque laeve, sed sub margine facierum commissuralium breviter regulariterque sulcata, basi obscure biauriculata, auriculis laevibus.

Typus speciei: Kenya, Northern Frontier Province, Wajir, 27 May 1952, *Gillett* 13371!. Holotypus in Herb. Kew. (K).

Corbichonia rubriviolacea (*Friedr.*) *Jeffrey*, comb. nov.

Orygia rubriviolacea Friedr. in Mitt. Bot. Staats. Munchen 8: 340 (1953)

Type: South West Africa, *H. & E. Walter* 2366 (M, holo.).

Trianthema portulacastrum *L.* is established (in Sp. Pl. 223: 1753) without a phrase-name but by some references to previously published works. The first of these, '*Sauv. meth.* 127' refers to a description in Sauvages' 'Methodus Foliorum seu Plantae Monspelienses' in which is given sufficient floral detail of the plant there involved to enable its inclusion under *Pentandria Digynia*, where indeed it is placed by Linnaeus.

The other elements cited by Linnaeus are the following:

'Portulaca curassavica procumbens, capparidis folio, flore muscoso, capsula bifurca. *Herm. par.* 213 *t.* 213. *Raj. suppl.* 506.'

'Portulacae affinis, folio subrotundo, flore pentapetalo dilute purpureo. *Sloan. jam.* 89. *hist.* I. *p.* 205. *Raj. suppl.* 506.'

'Kali curassavicum procumbens, foliis subrotundis. *Pluk. alm.* 202. *t.* 95. *f.* 4.'

None of these (except perhaps the plate in the Paradisus, which gives a hint that the plant there illustrated might possess but one style) gives sufficient floral detail to enable the plants concerned to be placed in the Linnaean system. However, it is clear (1) that these latter elements are all referable to one monogynous species, two specimens of which (the respective types of the Sloane and Hermann elements) are to be found in the Sloane herbarium; and (2) that this is the species generally accepted as *T. portulacastrum* L. This same species was described by Linnaeus later (in Mant. **1**, 69:1767) as *T. monogyna*, under which he cites his own *T. portulacastrum* as a synonym.

The digynous plant of the Sauvages, however, is clearly a different species, which I consider conspecific with that later described by Linnaeus (Mant. **1**, 70: 1767) as *T. pentandra*. Since this element must have been the one considered by Linnaeus when he placed *T. portulacastrum* in his system, it might be argued that it is by this one alone that *T. portulacastrum* ought to be typified. However, there are three arguments against this view. The first is that Linnaeus gives his *T. portulacastrum* as a synonym of his *T. monogyna*. Secondly, a typification for the species has already been indicated; Fawcett & Rendle in 'Flora of Jamaica' **3**(1), 167 (1914) designate the type of *T. portulacastrum* as being in the Sloane Herbarium. Thirdly, the generally accepted use of *T. portulacastrum* L. has been for the monogynous plant. Further, I feel that the mental image Linnaeus had in mind when he established his *T. portulacastrum* was of the monogynous plant, and that had he been presented with a specimen of each (without the floral details, not obvious unless the flowers are dissected, having been revealed) he would have identified the monogynous plant with his *T. portulacastrum*. Therefore I feel justified in proposing as lectotype for the species *Trianthema portulacastrum* L. the plate and description in Hermann,'Paradisus Batavus' 213, t. 213 (1698), 'Portulaca Corassavica procumbens Capparidis folio flore muscoso, capsula bifurcata', for which the Hermann specimen in the Sloane Herbarium may represent the typotype. This also has the effect of stabilizing the application of the generic name *Trianthema* L., since *T. portulacastrum* L. is its type species, and I propose (see below) to transfer the digynous plant to another genus.

Some confusion of generic limits was encountered during investigation of the species of *Sesuvium* L. and *Trianthema* L. Clarification of the problem has resulted in the separation of three genera and the splitting of *Trianthema sensu stricto* into two subgenera, as follows:

1. **Trianthema** *L.* Type species: **T. portulacastrum** *L.*, Sp. Pl. 223 (1753)

subgenus **Trianthema**

subgenus **Papularia** (*Forsk.*) *Jeffrey*, stat. et comb. nov. Type species: **Trianthema crystallina** (*Forsk.*) *Vahl*, Symb. Bot. **1**, 32 (1790)

syn. *Papularia* Forsk., Fl. Aegypt.-Arab. 69 (1775) pro. gen.

2. **Sesuvium** *L.* Type species: **S. portulacastrum** (*L.*) *L.*, Syst. ed. 10: 1058 (1759)

3. **Zaleya** *Burm. f.* Type species: **Z. decandra** (*L.*) *Burm. f.*, Fl. Ind. 110, t. 31 (1768)

These taxa may be distinguished as in the following key:

Operculum of capsule 2-valved, the valves usually separating; ovules 4, attached at one side to the interlocular septum; ovary 2-locular; stigmata 2 . . . . . **Zaleya**

Operculum of capsule one-valved, capsule pyxidiate:
Styles 2–5; ovary 2–5-locular; placentation axile; ovules many; flowers usually solitary . . . . . **Sesuvium**
Style 1; ovary 1-locular; placentation parietal; flowers solitary or clustered . . . . . **Trianthema**
Ovules 4–many; flowers usually solitary . . subgen. **Trianthema**
Ovules 2, superposed; flowers usually clustered . . . . . subgen. **Papularia**

Certain new combinations and reductions to synonymy are made below:

Trianthema triquetra [*Rottler ex*] *Willd.* subsp. **parvifolia** (*Sond.*) *Jeffrey*, stat. et comb. nov.

Trianthema parvifolia Sond. in Harv. & Sond., Fl. Cap. 2: 598 (1862). Type: South Africa, Gamka River, *Drège* (BM, iso.!, K, iso.!)
Trianthema crystallina (Forsk.) Vahl var. *rubens* Sond., *l.c.* Type: South Africa, Orange River, *Drège* (K, iso.!)
Trianthema crystallina (Forsk.) Vahl var. *corymbosa* Sond., *l.c.* Type: South Africa, Orange River, *Drège* (K, iso.!)
Trianthema hereroënsis Schinz in Bull. Herb. Boiss. **5**, app. 3, 76 (1897). Type: South West Africa, *Stapff* (Z, holo.)

Trianthema triquetra [*Rottler ex*] *Willd.* subsp. **triquetra** var. **sanguinea** (*Volkens & Irmscher*) *Jeffrey*, stat. et comb. nov.

Trianthema sanguineum Volkens & Irmscher in Engl., Bot. Jahrb. 48: 497 (1912). Type: Tanganyika, Moshi District, between Himo and Pangani River, *Volkens* 458 (B, holo.!)
Trianthema nigricans Peter in Fedde, Repert., Beih. **40**(2), Anhang 30 (1932). Type: Tanganyika, Masai District, Emugur Belekj, *Peter* 42741c (B, holo., destroyed)

Zaleya pentandra (*L.*) *Jeffrey*, comb. nov.

Trianthema pentandra L., Mant. **1**, 70 (1767). Type: cultivated at Uppsala from seed sent by Forskål from Arabia (LINN, lecto.).

Trianthema redimita Melville in Kew Bull. **7**, 268 (1952). Type: Kenya, Northern Frontier Province, Mudo, near Wajir, *Dale* K700 (K, holo.!)

Zaleya sennii (*Chiov.*) *Jeffrey*, comb. nov.

Trianthema sennii Chiov., Fl. Som. **2**, 225 (1932). Type: Somalia, Mahaddei, *Senni* 666 (FI, holo.!)

The species concept in Palaeontology

'. . . and heard great argument,
About it and about: but evermore
Came out by the same door as in I went.'

It is hard for taxonomists who deal with contemporary organisms to agree on what they mean by a species. But the specific names which they use should, among animals though not always among plants, correspond to discrete entities in the real world: populations whose members interbreed among themselves but are unable, or almost unable, to do so with members of other groups. Taxonomists dealing with the organisms of a single past epoch may also hope to name similar populations which lived at that time. But when palaeontologists try to name organisms succeeding one another in time there can be no such barriers separating one generation from the next and taxonomy becomes essentially subjective, the more so as gaps in the geologic record are filled in.

'In a phylogenetic continuum a "species" is a kind of nebulous and fluctuating area in a ceaseless process and has no temporal, morphologic or genetic boundary between it and preceeding or subsequent areas.'

And yet, as we can only refer to organisms by names, and as there are enormous theoretical and practical advantages to be gained by naming extinct organisms, whose fossils often supply the best means for identifying geologic strata and understanding the course of evolution, the irrational attempt to name these organisms has to be made, and is made with some success, just as mathematicians operate successfully with concepts such as $\sqrt{-1}$ which they know to be irrational.

The present symposium* by 16 British and one American palaeontologist provides the best, perhaps the only thorough, account of the methods, tricks and obstinate perplexities of those who practise this fascinating, irrational and necessary art. If it reduces the reader to the despair of Omar Khayyam; let him reflect that Omar in his despair made great discoveries.

J. B. Gillett

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* *The species concept in Palaeontology*: *a symposium*. Systematics Association Publication No. 2. Edited by P. C. Sylvester-Bradley. Pp. vi + 145. London: British Museum (Natural History), 1956. Price 12/6.

Studies in the *Gramineae*: I

W. D. Clayton

CHLORIDEAE

Chrysochloa caespitosa *W. D. Clayton*, sp. nov.; affinis *C. subaequiglumae* (Rendle) Swallen, sed habitu caespitoso, spiculis antherisque brevioribus differt.

Gramen perenne, dense caespitosum, usque 70 cm. altum, e rhizomate brevissimo ortum. *Culmi* erecti, solitarii, simplices vel nonnunquam ramosi, 3–5 nodes, glabri, laeves, nitentes, inferne compressi, superne teretes, internodio summo filiformi usque 20 cm. longo e vagina longe exserto. *Foliorum vaginae* glabrae, striatae, basales firme chartaceae marginibus hyalinis, arcte imbricatae, a latere valde compressae, acute carinatae, 2–4 cm. longae, intermediae carinatae, internodiis demum multo breviores; ligulae brevissimae, truncatae, minute ciliolatae; laminae glauco-virides, glabrae, arcte conduplicatae et carinatae, explanatae apice obtusae et mucronatae, marginibus et carina apicem versus minute scaberulae, ceterum laeves, inferiores 4–14 cm. longae et usque 4 mm. latae, superiores breviores, summae ad mucronem redactae. *Spicae* 3–5-natae, plus minusve erectae, 6–8 cm. longae, graciles, strictae; rhachis gracillima, circiter 0·3 mm. lata, marginibus scaberula. *Spiculae* subsessiles, anguste elliptico-oblongae, dense imbricatae, a latere valde compressae, 3·5 mm. longae, flavido-virides. *Glumae* subaequales, spicula aequilongae, carinatae, tenuiter membranaceae, 1-nerves, glabrae, carina viridi scaberulae; gluma inferior explanata lanceolato-elliptica, acuta; superior anguste ovata, obtusa, prope apicem aristam 0·5–0·7 mm. longam gerens. *Anthoecium inferum* ♀; callus brevissimus, obtusus; lemma carinatum, explanatum ovatum, acutum, 3·5 mm. longum, integrum, carina pilis appressis et nervis lateralibus pilis longioribus patentibus usque 1·5 mm. longis dense albo-ciliatum, membranaceum, translucens, 3-nerve, aristatum; arista subterminalis, usque 1 mm. longa; palea anguste ovata, acuta, lemmate paullo brevior, glabra; antherae 3, 1·1 mm. longae. *Anthoecium superum* sterile, 1·5 mm. longum; lemma explanatum oblongo-ellipticum, obtusum, glabrum, exaristatum; palea linearis. *Caryopsis* elliptica, subtriquetra, 1·6 mm. longa, pallide brunnea; hilum basale, punctiforme; embryo caryopsi dimidio minor.

Ghana. Christiansborg, Mar. 1902, *Johnson* 1018! (Holotypus in Herb. Kew.). Mile 35·5 on Accra–Ada road, in grassland, 17 June 1956, *Adams* 4353!. Second bridge, Kpong Pilot Area, well drained clayey soils on lower slopes, 3 Apr. 1952, *Asima* SLUS/120! College Farm, Nungua, 3 May 1954, *Boughey* GC14062!

Hubbard (Kew Bull. **12**, 60: 1957) has previously suggested that two of the specimens cited might be referable to a new species, distinguished by its densely tufted perennial habit and very short rhizome. The examination of further material, together with a verbal account by Dr. C. D. Adams of its appearance in the field, has confirmed this supposition and the new species is here described.

Ctenium sesquiflorum *W. D. Clayton*, sp. nov.; affine *C. canescenti* Benth., sed absentia anthoecii I, arista lemmatis fertilis dorsali, paleae apice tridentato differt.

Gramen; partes basales incognitae. *Culmi* adscendentes, saltem 30 cm. longi et 8-nodes, teretes, tenuiter striati, circiter 1 mm. diametro, prope paniculam scaberuli, ceterum glabri. *Foliorum vaginae* internodiis pedunculoque aequilongae, striatae, minute scaberulae, herbaceae; margines superne hyalini, in auriculas breves 0·7 mm. longas producti; ligulae membranaceae, brevissimae, 0·7 mm. longae, truncatae, denticulatae; laminae lineares, siccitate involutae, supra et subtus minute scaberulae, usque 35 cm. longae, basi usque 3 mm. latae, in acumen longe attenuatae. *Spicae* 4-natae, digitatae, erectae vel oblique patentes, curvatae, 6–10 cm. longae; rhachis scaberula, circiter 0·5 mm. lata, parte summa (5 mm. longa) spiculas minores gerente et mucrone terminata. *Spiculae* sessiles, anguste obovato-ellipticae, dense imbricatae, a latere compressae, 3·5–4 mm. longae, cinereo-virides. *Gluma inferior* ovata, 1 mm. longa, 1-nervis, carina scabrido-ciliata excepta glabra. *Gluma superior* explanata lanceolata, acuta, 3–3·5 mm. longa, minute scaberula, 2-nervis, carina tuberculis pallide flavidis translucentibus infra medium praedita, nerva laterali e medio aristam obliquam 1·5 mm. longam gerente. *Anthoecium I* sterile, ad vestigium minutissimum subulatum raro pilosum 0·1 mm. longum redactum. *Anthoecium II* sterile; lemma anguste lanceolatum, 1·5 mm. longum, integrum, 1-nerve, carina raro pilosa, e media carinae aristam 4·5 mm. longam gerens. *Anthoecium III* ♀; lemma explanatum elliptico-ovatum, subacutum, membranaceum, carinatum, 3-nerve, raro pilosum, 3–3·5 mm. longum, integrum, marginibus circa medium ciliatis, aristatum; arista stricta, usque 3·5 mm. longa, prope mediam carinae orta; palea a latere visa anguste oblanceolata, membranacea, 2-nervis, carinis scaberulis exceptis glabra, apice 3-dentato, lemmate paullo brevior; antherae 1·5 mm. longae. *Anthoecium IV* sterile, ad vestigium minutissimum subulatum redactum.

Guinea Republic. High plateau, between Detinn and Diaguissa, Apr. 1905, *Chevalier* 12860! (Holotypus in Herb. Kew.).

Ctenium sesquiflorum differs from other species of *Ctenium* in being apparently 2-flowered. However the presence of a minute suppressed floret between the lower glume and the fertile lemma, reveals its affinity to the other members of the genus which have two sterile lemmas below the fertile floret.

Flowers of northern Oregon.*—This is another popular flower-book, designed for nature-lovers and young people. The plants described are herbs and shrubs found flowering in June in an area of the lower Columbia River Valley, on the border of the western States of Oregon and Washington. The text begins with a practical key to all the genera included, and the description of each species is followed by notes on habitat, distribution and other comments. A number of the herbs are well-known introductions from Europe. The diagrams in the introduction and the concluding glossary are accurate and clear, while the pleasing full-page line-drawings are by a former illustrator for the Royal Horticultural Sociey.

N. Y. Sandwith

* *Spring flowers of the Lower Columbia Valley*. By C. Chapman Hill, illustrated by M. C. Miles. Pp. xi + 164, 24 text-figures and 71 full page line-drawings. Seattle: University of Washington Press, 1958. Price $3.00.

Researches on *Silene maritima* and *S. vulgaris*: XXXV*

E. M. Marsden-Jones and W. B. Turrill

PLANTS FROM A SERPENTINE AREA IN BOSNIA

It is well known that soils derived from serpentine rocks often have a vegetation some of whose constituents are peculiar in that they belong to taxa limited to such soils. Such taxa have variously been described as species or as subspecies or varieties of more widely ranging and ecologically distributed species. Soils overlying and originating from serpentine rocks occur in south-west England and in western Scotland and in many parts of Europe and North America, and probably in other continents. The literature dealing with the plant life of serpentine soils is now fairly extensive but is widely scattered in various publications. There are serpentine rocks in various parts of the Balkan Peninsula, resulting in edaphic conditions which vary in different parts apparently largely in correlation with the amount and seasonal distribution of rainfall (see Turrill, 'Plant Life of the Balkan Peninsula' 30–1: 1929).

The serpentine flora of Bosnia is being studied by H. Ritter-Studnička of Sarajevo and reference may be made to two of her papers: 'Das Calluneto-Ericetum in Bosnien' in Österr. Bot. Zeitschr. **100**, 80–90 (1953) and 'Beitrag zur Ökologie der Serpentinflora in Bosnien' in Vegetatio **7**, 89–98 (1956). Later, in Österr. Bot. Zeitschr. **105**, 288 (1958), she named and described *Silene vulgaris* (Mnch.) Garcke subsp. *alpina* (Lam.) Schinz et Kell. var. *serpentina* var. n. The following is a translation of the original description: Stems ascending in the lower part, up to 30 cm. high, few-flowered. Leaves small, acuminate, the length 3 to 4 times the breadth, the lower ones narrowly lanceolate, 14–18 mm. long, 3–6 mm. broad. Calyx generally suffused with purple-violet. Bracts small, membranaceous. Petals without corona (paracorolla), rarely with bosses (tubercles) at the base (of the lamina). Habitat 'in glareosis serpentinicis prope Zepče, 220–350 m.' It is noted that the var. *serpentina* differs from subsp. *alpina* var. *alpina* (as it should now be named) by narrower and smaller leaves and by the taller stems which mostly have more flowers. Reference is made to the occurrence of some examples with spathulate broader leaves which link up with those of subsp. *alpina* var. *alpina*. This is so in shade-forms or for single leaves of basal shoots lying on damp ground. In the Zepče district the taxon (die Art) is always found only on loose serpentine scree, as on the Boljak, Kik, near Papratnica and especially frequently in the valley of the Ograjni Potok as not far from the mouth of this stream in the open serpentine brushwoods above the road.

Mrs. Ritter-Studnička kindly sent us herbarium specimens from two localities of the newly described variety. From one collecting we sorted out ripe seeds which were grown in the Herbarium Experimental Ground at Kew. The information on the label of the collecting with the seeds is: 'In

* Continued from Kew Bull. **11**, 573 (1957)

glareosis serpentinicis regionis Mt. Konjuh prope Maoča, cca. 300 m., 16.7.1958, *H. Ritter*.' Mt. Konjuh is a mountain in the serpentine district (its altitude is said to be 1328 m.) and Maoča is the name of a right bank tributary of the river Krivaja (itself a tributary of the R. Bosna which flows into the R. Save) and there is also a small railway station bearing this name. The seeds were sown in the autumn of 1958 and the majority germinated within a month though a few remained dormant to germinate in the spring of 1959. Seedlings were planted out in the open ground in the spring of 1959 and grew and flowered well. Most of the plants raised were scored for vegetative and floral characters on 3 August, 1959, and a few of the later germinating ones on 7 October, 1959. Fruits and seeds were collected on 18 September, 1959, and 7 October, 1959. 30 plants were scored fully (except two not scored for fruits) and one which did not flower was scored for vegetative characters only.

The results obtained were as follows:—

Habit. Hemicryptophytic. All the plants have died down completely by mid-winter.

Flowering stems. Erect to ascending; from 8 to 46 cm. in length, mean 23·2 cm., S.D. 9·78.

Indumentum. All plants glabrous.

Anthocyanin in vegetative parts. Much 2: medium 13: little 16.

Leaves. Linear to narrowly elliptic-lanceolate or narrowly elliptic-oblanceolate, 12 to 35 mm. long, mean 20·9 mm., S.D. 4·93, 2 to 10 mm. broad, mean 5 mm., S.D. 1·68, correlation of length to breadth $r = 0{\cdot}77$.

Inflorescences. Number of flowers per inflorescence 1 to 7, mean 3·83, S.D. 1·48.

Flowers. All definitely zygomorphic.

Calyx. Inflated 9: subinflated 18: narrow 3; anthocyanin in calyx much 1: medium 14: little 15.

Petals. White 30; bilobed 30; ¾-lobing 30; corona bosses 30 (often very little developed); anthocyanin blotch present 6: absent 24; petals and segments not overlapping 30.

Sex. Hermaphrodite 29: female 1.

Anthocyanin in filaments and anthers. Present 29.

Stigmata. Purple 15: white 15.

Immature seed colour. White 30.

Capsules. Of *S. maritima* type 28 but teeth spreading in 5, reflexed in 23.

Mature seeds. Armadillo 30, with the flat plates very numerous and fine.

Discussion

There is no doubt that the interesting sample here considered has to be placed in the aggregate species *Silene vulgaris* (Moench) Garcke as accepted by us in 'The Bladder Campions' 20 (1957). The hemicryptophytic habit and the zygomorphic flowers with the petals and petal lobes not overlapping are characteristic. We have, however, to consider in more detail the question

of the subspecies. The name *Silene alpina* has been a source of difficulty and some confusion. We have discussed the matter in Kew Bull. **4**, 319–20 (1949) and in 'The Bladder Campions' 136 (1957) and we finally accepted the name and status of *Silene vulgaris* (Moench) Garcke subsp. *alpina* (Lam.) Schinz. et Kell. Similarly we have, in the places cited, discussed *Silene glareosa* Jordan and have accepted for it the name and status *Silene vulgaris* (Moench) Garcke subsp. *glareosa* (Jord.) Marsden-Jones et Turrill. Careful descriptions of these two subspecies prepared from numerous living plants in the wild and in cultivation were published in Kew Bull. **5**, 36 seq. (1950). We have no reasons for altering our concepts, as published in 1957, as the study of some additional material supports them. It is, however, worth drawing attention to our published statements that 'Intermediates between subsp. *alpina* and both subsp. *vulgaris* and subsp. *glareosa* occur' ('The Bladder Campions' 136) and that material from 'farther east', i.e. Austria and east and south of Austria, may have had an origin from the widely ranging subsp. *vulgaris* independent of the more western typical subsp. *glareosa* (France and Switzerland) even when on morphological characters it is classified as *S. vulgaris* subsp. *glareosa*.

As we have accepted the subspecies *alpina* and *glareosa*, the Bosnian material here considered has to be placed under the latter. Mrs. Ritter-Studnička in her account of the var. *serpentina* rightly distinguishes it from '*alpina*' proper but does not refer to subsp. *glareosa*. This last has been called '*alpina*' (as species, subspecies, or variety) by many authors but is distinguished by its usually taller growth, with narrower leaves (especially relative to their length), and a higher mean number of flowers per inflorescence. In all of these characters the Bosnian serpentine plants agree with subsp. *glareosa* rather than with subsp. *alpina*. Moreover, subsp. *alpina*, as we accept it, is a plant of higher altitudes, whereas subsp. *glareosa* is not an 'alpine' plant in the sense of growing above the tree altitudinal limit but occurs within the forest belt, though usually in open places, as on screes. The altitudes on the labels for wild herbarium material of the Bosnian serpentine plants are 280 m. (in valle Ogragini Potok prope Zepče) and 300 m. (mt. Konjuh prope Maoča). These are relatively low altitudes. While, then, we would, on characters of structure and behaviour place the Bosnian serpentine material under *S. vulgaris* subsp. *glareosa* the question of its status as a variety remains. The material grown at Kew from seed shows a certain range of variation in what may be termed minor taxonomic characters and of the kind we meet with in most wild populations within the aggregate species *S. vulgaris*. Thus, we have a similar range of such characters in subsp. *glareosa* from the French Alps. It is difficult to distinguish the Bosnian serpentine material studied from subsp. *glareosa* of the French Alps but we may note the constancy in the Bosnian plants scored of the absence of indumentum, the white bilobed petals with $\frac{3}{4}$-lobing, the complete absence of coronal scales (even bosses are often scarcely visible), the not overlapping (diverging) of petals and petal laminar segments, the presence of anthocyanin in filaments and anthers, the white immature seed colour, and the armadillo seed pattern with the flat plates very numerous and fine. It seems probable that there has been a degree of uniformity brought about either by geographical isolation or by habitat selection. Only intensive field studies on the serpentine habitat can give a correct evaluation of the selective

factors. Meantime it is probably most useful to regard the Bosnian serpentine plants as representing an ecotypic population under the name *Silene vulgaris* subsp. *glareosa* var. *serpentina*.

The Phlox family.*—The study of the biology of the whole plant does not seem to occupy as prominent a position among the various contemporary botanical '-ologies' as it deserves. In this age of specialization, students, of all ranks, need constantly to be reminded that there is more to the biology of the living plant than sieve cells, chromosomes, or name changes. The subsciences of ecology and experimental taxonomy, the spiritual heirs of the old science of Natural History, have promised to have particularly fruitful approaches to the studies so ably begun by Henslow, Darwin, and Kerner von Marilaun.

'The Phlox Family' by Verne Grant is an outstanding contemporary attempt to give a bird's-eye view of the biology of a small and rather natural plant family. Though its author has published a number of very exhaustive studies of various genera, or parts of genera, in the *Polemoniaceae*, the present work is not so much a scientific treatise as it is a lively and pleasantly written summary of what other students have said about various members of the Phlox family. The author does include some new data on chromosome numbers, some very attractive line illustrations, and a systematical rearrangement of the genera, but, by and large, we cannot help but be impressed by the scantiness of the information that is available even now, and the ingenious use that has been made of it here.

Although a great deal of very interesting information has been summarized, it seems a little unfortunate that, in a volume dealing primarily with the systematics of the *Polemoniaceae*, much nomenclatural change has been introduced in all ranks, without the evidence that would have been supplied by a taxonomic and nomenclatural revision of all of the various taxa. The overall systematic arrangement obviously owes a great deal to Brand's account of the family in 'Das Pflanzenreich' (1907) and is inferior to that publication by the absence of keys to the taxa. It is also difficult to agree with the author that any very useful conclusions about the relationships of taxa, or about their geographical distribution, can be made without careful study of all of the plants involved—though it may be that the *Polemoniaceae* differ from other plant families in this respect.

Whatever the case may be, we must agree that Dr. Grant has produced a most interesting volume. It is to be hoped that the promised, and eagerly awaited, second volume, dealing with the reproductive biology of the *Polemoniaceae*, will have a more substantial taxonomic basis than that produced here.

G. P. DeWolf

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* *Natural History of the Phlox Family*. Volume I, Systematic Botany. By Verne Grant. Pp. xv + 280, colour frontispiece, 79 figures, 14 tables. The Hague: Martinus Nijhoff, 1959. Price 19 guilders.

Notes on *Solanum*

H. Heine

The following comments have been brought to light during my revision of *Solanum* L. for the revised edition of the 'Flora of West Tropical Africa.'

Solanum guineënse *L.*, Sp. Pl. 184 (1753); ed. 2, 263 (1762); Burmann, U.L., Fl. Ind. nec non Prodr. Fl. Cap. 55, t. 22, fig. 1 (male!) (1768); A. Gras in Bull. Soc. Bot. France **10**, 594 (1864); Adamson & Salter, Fl. Cape Penins. 703 (1950)

S. sempervirens Mill., Gard. Dict., ed. 8, No. 25 (1768)

Atropa solanacea Linn., Mant. Alt. 205 (1771); Trew, Pl. Rar. **2**, 9, t. 16 (1779); Thunb., Fl. Cap. **2**(1), 62 (1818) & Fl. Cap., ed. Schultes, 191 (1823)

Solanum aggregatum Jacq., Coll. **4**, 124 (1790) & Ic. Rar. **2**, 10 (1796), t. 323 (1792) [cf. B. G. Schubert, in Contr. Gray Herb. **154**, 7 (1945)]; Willd., Enum. Pl. Hort. Berol. 234 (1809); Dunal, Hist. Sol. 146 (1813) & Solan. Syn. 22 (1816); Drège in Linnaea **20**, 203 (1847); Dunal in DC., Prodr. **13**(1), 160 (1852); C. H. Wright in Fl. Cap. **4**(2), 91 (1904) & in Fl. Trop. Afr. **4**(2), 214 (1906); Bitter in Engl., Bot. Jahrb. **54**, 425 (1917)

S. dasypus E. Meyer in Drège, Zwei Pflanzengeogr. Docum. 103 (1843); Dunal in DC., Prodr. **13**(1), 161 (1852); Wright in Fl. Cap. **4** (2), 91 (1904)

S. monticolum Dunal in DC., Prodr. **13**(1), 161 (1852)

Solanum lignosum africanum sempervirens laurinis foliis Commelin, Hort. med. Amst. rar. pl. descr. et icones **2**, 191, t. 96 (1701)

Solanum africanum lignosum folio atroviridi angusto oblongo obtuso Boerhaave, Index alt. pl. hort. acad. Lugd.-Bat. alunt. 68, No. 16 (1720)

Solanum caule inermi perenni, foliis ovatis integris, floribus ad basin ramulorum confertis van Royen, Fl. Leyd. prodr., exhibens pl. hort. acad. Lugd.-Bat. alunt. 424, No. 7 (1740)

Linnaeus' *Solanum guineënse* is based on Boerhaave's and van Royen's descriptions and on corresponding plants in his herbarium, named here *Solanum guineënse* as well as *Atropa solanacea* (see Savage, Cat. Linn. Herb. 37 (1945), No. 246: 4 [ex herb. Cliff.]; No. 246: 5). The name '*Atropa guineensis*', used by Savage in his 'Catalogue', has never occurred in any printed botanical work and was not even noted on the corresponding sheet in the Linnean Herbarium. The plants in the Linnean Herbarium are an excellent match with Commelin's above-mentioned plate, which was cited subsequently in Linnaeus' 'Mantissa altera' (1771) as an illustration of *Atropa solanacea* (this name was used here for the first time). The typification of Linnaeus' *Solanum guineënse* is, therefore, no longer in doubt; all the above-listed pre-Linnean descriptions of that plant are cited by Linnaeus himself, and the plants in his herbarium are conspecific. The fact that the plant is lacking in Linnaeus' 'Hortus Cliffortianus' (1737), and also lacking in the herbarium of the Hort. Cliff. now in the British Museum (there is only a wrongly identified specimen which is not cited in the 'Hortus Cliffortianus', originally, labelled with Commelin's polynomial and an additional note '*Atropa*

solanacea'), but is represented in the Linnean herbarium and particularly by a specimen from Hortus Cliffortianus itself, shows the difficulty Linnaeus had in using the botanical literature as well as in applying the names which were used in it. This *Solanum* had been in cultivation in the Netherlands since Commelin's time in the gardens of Amsterdam, Leyden and also in the Hortus Cliffortianus at Hartekamp, where Linnaeus could not identify it during the preparation of his 'Hortus Cliffortianus' and presumably kept the specimen in his own herbarium for further study. It is evident that Linnaeus used Boerhaave's 'Index' for the preparation of the genus *Solanum* for his 'Species Plantarum', ed. 1: he copied Boerhaave's polynomial for this species, and accepted the epithet 'guineense' as well as the geographical distribution—taken by himself apparently only from that epithet—'Habitat in Guinea' erroneously from the next species (No. 17) in Boerhaave's 'Index', where it is published exactly on the following line of the same page (68): 'Solanum; Guineense; fructo magno instar Cerasi, nigerrimo, umbellato.' The unusual change of the epithet from '*guineense*' to '*solanacea*' for the same species in the 'Mantissa altera' (1771) seems to indicate that Linnaeus had discovered his mistake and wanted to correct it. Boerhaave's Solanum No. 17, however, belongs to the *Solanum nigrum*-complex, and Linnaeus has taken from its polynomial in Boerhaave's 'Index' the basonym for his *Solanum nigrum* δ *guineense* (Sp. Pl. 186: 1753), and cited for it the description and plate of Dillenius in Hort. eltham. 366, t. 274, fig. 354 (1732), where the polynomial of Boerhaave (l.c.) was also used for it. This variety of *Solanum nigrum* L. as well as Boerhaave's polynomial and Dillenius's above-mentioned description and plate are also mentioned in Linnaeus's 'Hortus Cliffortianus' 60 (1737), where the plant is treated as synonymous with *Solanum nigrum*. Corresponding specimens are lacking in the Linnean Herbarium, but they are well represented in the Cliffortian Herbarium. Boerhaave's polynomial was not only used by Dillenius for his description and plate (1732); the epithet 'guineense' in it was also the basonym for Miller's *Solanum guineënse* (Gard. Dict., ed. 8, Solanum No. 7 (1768)) and Lamarck's *Solanum guineënse* (L.) Lam. (Ill. 2: 18 (1797)).

Both *Solanum guineënse* Mill. (1768) and *S. guineënse* (L.) Lam. (1797) are illegitimate names in specific rank for *Solanum nigrum* L. var. *guineënse* L. This *Solanum* does not occur wild in Guinea, but it is cultivated there as a pot-herb and for medical purposes; nor apparently is it a native of any part of Africa (cf. Bitter in Engl., Bot. Jahrb. **49**, 562: 1913). The only correct name (in varietal rank) for it is *Solanum nigrum* L. var. *guineënse* L. (1753). Linnaeus' *Solanum guineënse*, however, has never been found in West Tropical Africa, and all notes in the literature like 'habitat in Guinea', 'Guinea, ex Jacquin' (Fl. Trop. Afr. **4**(2), 214: 1906), etc., are based upon Linnaeus' copying mistake.

Bitter (Engl., Bot. Jahrb. **54**, 427: 1917) stated in his study of African *Solana* that it must be 'very unlikely' that this South African species occurs in West Tropical Africa, but he was not able to find out the origin of this wrong geographical indication. He accepted also a later synonym for this plant (*S. aggregatum* Jacq.), and following his citations of the literature, it seems to be clear that he could not have used the pre-Linnean literature. The first modern taxonomic work which accepted the correct name '*Solanum guineënse* L.' is Adamson & Salter's 'Flora of the Cape Peninsula' (1950).

J. Soria and Ch. B. Heiser proposed in a very recent publication (Baileya **71**, 33: 1959) a new name for *Solanum nigrum* L., var. *guineënse* L. in specific rank (*Solanum intrusum* Soria, l.c.); but this was quite superfluous and is only a further synonym. The question of the nomenclature of this plant has already been very carefully studied by A. Gras (in Bull. Soc. Bot. France **10**, 592–595: 1864), who has pointed out that the only correct name in specific rank for the plant in discussion is *Solanum melanocerasum* Allioni (Auct. ad Syn. Meth. Stirp. Hort. Taurin. 64, No. 43 in Misc. Taur. **5**, 1770–03: 1774) [see also O. Mattirolo in Scritt. Bot. Cent. C. Allioni 71: Genova 1904]. In 1859, Fr. Welwitsch described a *Solanum tinctorium* Welw. (Apont. 551, 590, No. 95: 1859) which is clearly a synonym in specific rank for this taxon. The nomenclature was again discussed by A. Thellung (in Rep. Bot. Soc. & Exch. Club Brit. Isles **8**, 187: 1927) who missed firstly Gras's publication of 1864 and also proposed there a superfluous new name: *Solanum boerhaavii* Thell. He recognized later his mistake and corrected it; see S. Polgár in Acta Hort. Gotoburg. **13**, 286 (1939). Owing to the complexity of the *Solanum nigrum* group, it seems most preferable to use a name in infraspecific rank, as it is mentioned above. It should be noted here that the plant originally labelled '*Solanum guineense fructu magno instar Cerasi, nigerrimo, umbellato*' in the herbarium of the Hortus Cliffortianus is a typical specimen of that taxon which was later named by Jacquin *Solanum nodiflorum* Jacq., Collect. **2**, 288 (1788), and Ic. **2**, 11, t. 326 (1788). This name has been used many times for *Solanum nigrum* L., var. *guineënse* L., for example partly in Hiern, Cat. Afr. Pl. Welw., Dicot., **3**, 745 (1898), in the Fl. Trop. Afr. **4**(2), 218 (1906) and also subsequently in Hutchinson & Dalziel, Fl. W. Trop. Afr. **2**, 208 (1931), etc., but there is no doubt that this is not justified, and *Solanum nodiflorum* Jacq., although another segregate of the *Solanum nigrum*-complex, cannot be cited in the synonymy of the var. *guineënse* L. of *Solanum nigrum* L.; see also Stebbins & Paddock in Madroño **10**, 70–80 (1949).

Solanum terminale *Forsk.*, Fl. Aegypt.-Arab. 45 (1775); Bitter in Fedde, Rep. **18**, 301 (1922)

subsp. **terminale.**

S. bifurcatum Hochst. ex A. Rich., Tent. Fl. Abyss. **2**, 98 (1851); Exell, Cat. Vasc. Pl. S. Tomé 252 (1944); Milne-Redhead in Kew Bull. **3**, 467 (1949)

S. bifurcum Hochst. [in Flora **24**(1), Intellig. Bl. 24 (1841), *nom. nud.*] ex Dunal in DC., Prodr. **13**(1), 77 (1852); C. H. Wright in Fl. Trop. Afr. **4**(2), 213 (1906)

S. bilabiatum Dammer, in Engl., Bot. Jahrb. **38**, 181 (1906)

S. phytolaccoïdes C. H. Wright in Kew Bull. **1894**, 126 (1894)

subsp. **inconstans** (*C. H. Wright*) *Heine*, comb. nov.

S. inconstans C. H. Wright in Kew Bull. **1894**, 127; Fl. Trop. Afr. **4**(2), 211, partly (excl. *S. symphostemon* De Wild. & Th. Dur.); Bitter in Engl., Bot. Jahrb. **54**, 482 (1917); Fl. W. Trop. Afr. **2**, 207 (1931)

S. togoënse Dammer in Schlechter, Westafr. Kautschuk. Exp. 312 (1900) *nomen*, & in Engl., Bot. Jahrb. **38**, 59 (1905) *descr.*; Fl. Trop. Afr. **4**(2), 246, 571 (1906); Bitter, l.c. 478; Fl. W. Trop. Afr. 2: 207 (1931)

S. suberosum Damm. in Engl., Bot. Jahrb. **38**, 182 (1906); Bitter in Fedde, Rep. **18**, 307 (1922)

subsp. **sanaganum** (*Bitter*) *Heine*, comb. nov.

S. plousianthemum Dammer in Engl., Bot. Jahrb. **38**, 180 (1906); Bitter in Engl., Bot. Jahrb. **54**, 456 (1917), & in Fedde, Rep. **18**, 301 (1922)

S. bansoënse Dammer in Engl., Bot. Jahrb. **48**, 237 (1912); Bitter in Engl., Bot. Jahrb. **54**, 456 (1917), & in Fedde, Rep. **18**, 303 (1922) (var. *episporadotrichum* Bitter, *l.c.* (1922) subsp. *sanaganum* Bitter, *l.c.* 304 (1922)

subsp. **welwitschii** (*C. H. Wright*) *Heine*, comb. nov.

S. welwitschii C. H. Wright in Kew Bull. **1894**, 126 (incl. var. *strictum* & *oblongum*); Fl. Trop. Afr. **4**(2), 213; Bitter in Engl., Bot. Jahrb. **54**, 478 (1917) & in Fedde, Rep. **18**, 305 (1922); Fl. W. Trop. Afr. **2**, 208 (1931).

This is only a brief new arrangement of the taxa of *Solanum* belonging to the Sectio *Afrosolanum* Bitter (Engl., Bot. Jahrb. **54**, 440: 1917) which are represented in the 'Flora of West Tropical Africa'. The section is widespread in tropical Africa and needs, after a critical study, an entirely new conception. Bitter accepted, for the taxa belonging to this group, 21 species and many infra-specific taxa, but his revision was mainly limited to the material in the Berlin Herbarium, and he was unable to consult other important European herbaria. His severely critical approach to this well-defined group of climbing and extremely variable *Solana*, strictly limited to tropical Africa, resulted in a large number of small splits, from which the present writer brought together here the taxa concerned in the revision of the 'Flora of West Tropical Africa'. This process must be continued in the rest of the Continent.

Solanum wrightii *Benth.*, Fl. Hongk. 243 (1861); Hance in Journ. Linn. Soc. Bot. **13**, 114 (1872); Hemsley in Gard. Chron., ser. 3, **6**, 75, 81, fig. 13 (1889); Forbes & Hemsley in Journ. Linn. Soc. Bot. **26**, 172 (1890); Rusby in Mem. Torr. Bot. Club **6**, 86 (1896); Bull. Torr. Bot. Club **26**, 190 (1899); Buchtien in Contrib. Fl. Boliv. **1**, 170 (1910); C. H. Wright in Kew Bull. **1914**, 304; F. J. Chittenden, Dict. of Gardening **4**, 1978 (1951); R. E. Holttum, Gardening in the lowlands of Malaya, 113, 114, fig. a (1953).

[*Solanum grandiflorum* auct., non Ruiz & Pavon, Fl. Peruv. **2**, 35, t. 168, fig. B (1799); Koorders & Valeton, Bijdr. Booms. Java **9**, 261 (1903); Koorders-Schumacher, Syst. Verz. Herb. Koorders 1, Abt. 1, Java, Phanerog. 256. Fam., p. 12 (1912); Koorders, Exk. Fl. Java **3**, 163 (1912); Atlas Baumart. Java **2**, t. 315, 316 (1914); Bitter in Fedde, Rep., Beih. **16**, 180 (1923)]

[*Solanum macranthum* hort., non Dunal Sol. Syn. 43 (1816) & in DC., Prodr. **13**(1), 315 (1852), nec Hook., Bot. Mag. **71**, t. 4138 (1845); E. A. Carrière in Rev. Hort. **39**, 132, cum tab. col. (1867); I. R. Dale, Descr. List of Introd. Trees Uganda Prot. 65 (1953); A. J. Jex-Blake, Gardening in East Africa, ed. 4, 126, 331 (1957), and earlier editions]

This very handsome plant, a native of Bolivia, was first described from Honkong by Bentham, and afterwards found in its original country by various collectors (see C. H. Wright, 1914). It is now often cultivated in tropical gardens, including tropical Africa. The confusion of the synonymy started with Carrière's publication, and became nearly inextricable when Koorders accepted in his numerous publications (for the first time in 1903) for this plant a name of a quite different South American species. Unfortunately, the very careful writer on the 'Solana africana', Georg Bitter, was unable to discover Koorders' misinterpretation; he fixed the wrong identification and synonymy and therefore caused much confusion in applying the correct name for the well-known 'Potato-Tree', mainly in Africa.

The application of genetics to Cotton improvement.*—The severely factual title of this volume might lead one to expect yet another compendious cytological or genetical handbook in which much meat is embedded in a text so tough and arid that the reader's digestion and patience are taxed to their limits. One would, however, be entirely mistaken.

Within as little as eighty pages of text, Sir Joseph Hutchinson compares the genus *Gossypium* with those other genera to which it is most closely related (taxonomists will note with interest his condemnation of recent splits in *Thespesia*); he describes how *Gossypium* as a whole falls into four natural cytogenetic groups; and he traces the long and still partially hidden story of man's domestication of cotton both in the Old and New Worlds—a story which started with the first cultivation of *Gossypium herbaceum* race *africanum* (or something very like it) in southern Africa. So that, Sir Joseph suggests, traders went from time immemorial to Sofala on the coast of Mozambique not only for its gold but its cotton also. And thence, changing its nature to suit his purposes, man has taken cotton with him through the world.

Due prominence is rightly given to the brilliant results of the patient genetical research of the cotton breeder of modern times, and to the care with which the often difficult task has been surmounted of transferring desirable characters of heredity to a given genotype. The ways of ensuring purity of strain are described, and also the desirability of keeping going other thoroughly mongrel races as a source of variation for the breeder.

The text is based on a series of lectures delivered by the author at the North Carolina State College. It is clear, concise, and draws on remarkably wide evidence—indeed a masterly book, to be read with pleasure and mental improvement even by those not directly engaged in its subject.

J. P. M. Brenan

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* *The Application of Genetics to Cotton Improvement.* By J. B. Hutchinson. Pp. viii + 87. Cambridge: The University Press, 1959. Price 15/-.

A new species of *Caryodaphnopsis (Lauraceae)*

H. K. Airy Shaw

Amongst a number of interesting plants noted during a recent examination of the collection made by the late Dr. A. F. G. Kerr in Laos in 1932, was the following representative of the small genus *Caryodaphnopsis* Airy Shaw. Though evidently close to the three previously known species, it appears not to be referable to any of them, and the following description is therefore presented.

Caryodaphnopsis laotica *Airy Shaw*, sp. nov., *C. baviensi* (Lec.) Airy Shaw affinis, sed indumento pallido manifestiore, foliis latius ellipticis, petiolis brevioribus, inflorescentiis copiosius floribundis, floribus subminoribus, perianthii segmentis extra dense ochraceo-puberulis manifeste differt.

Arbor parva, c. 7 m. alta. *Rami* graciles, usque 2 mm. crassi, teretes, annotini fusci, minute puberuli vel glabrescentes, hornotini subcastanei, dense breviter fulvo-pubescentes. *Folia* opposita, rarius subopposita, adulta late elliptica (juniora interdum angustius suboblongo-elliptica), 10–16 cm. longa, 5·5–7·7 cm. lata, basi late cuneata, rarius subrotundata, apice breviter (1–2 cm.) caudato-acuminata, acumine subobtuso, integerrima, tenuiter chartacea, supra glabra, siccitate brunnea, subtus minutissime dissite puberula, glauco-pallida, pilis ipsis albis vel secus costam ochraceis, ab ipsa basi vel paullulo supra basin trinervia, nervis primariis 4(–6)-jugis, basalibus ultra medium folium (saepe usque duas partes) attingentibus, secundariis laxe reticulatis subscalariformiter dispositis, costa gracili et nervis primariis supra leviter insculptis secundariis obscuris, subtus omnibus prominentibus fuscis valde conspicuis; petiolus gracilis, 9–10 mm. longus, junior dense breviter fulvo-pubescens, adultus glabrescens, fuscus. *Inflorescentiae* axillares et terminales, usque 11 cm. longae et 3·5 cm. latae, thyrsoïdeae, multiflorae, undique dense fulvo-puberulae, ramis oppositis gracilibus (saepe altero longiore altero breviore ex eadem axilla exorto), ramulis ultimis florigeris subumbelliformiter dispositis, bracteis bracteolisque minutis cito caducis. *Flores* parvi, 3 mm. diametro (expansi); pedicellus usque 3 mm. longus. *Perianthii* segmenta exteriora minuta, ovata, vix 1 mm. longa; segmenta interiora ovata, 1·5–2 mm. longa, 1·5 mm. lata, obtusiuscula, extra longius intus minute puberula. *Stamina* generis, minuta, puberula, filamentis vix distinctis. *Ovarium* glabrum. *Fructus* ignotus.

Laos. Tatom, Chieng Kwang [Xieng Khouang], 1300 m., evergreen forest, 4 April 1932, *A. F. G. Kerr* 20983 (Herb. Kew.): 'Small tree c. 7 m. high'.

For an account of Kerr's journey to the mountain of Pu Bia, during which this plant was collected, see his article, 'A trip to Pu Bia in French Laos' in Journ. Siam Soc., Nat. Hist. Suppl. **9** (2), 193–223 (1933). The locality Tatom is mentioned on p. 199; see also plate 4, and sketch-map, p. 222.

This gathering was unknown to me at the time of writing my original notes on this genus (K.B. **1940**, 74: 1940; Hook., Ic. Plant. **35**, t. 3436: 1943). The locality lies some 150–200 miles to the south-west of Mt. Bavi, in Tonkin (N. Vietnam), the type locality of *C. baviensis*. The genus has not previously been recorded from Laos. *Caryodaphnopsis laotica* differs from *C. tonkinensis* (Lec.) Airy Shaw, and agrees with both *C. baviensis* and *C. henryi* Airy Shaw, in its very small flowers, but differs from the two latter in its

perianth-segments being strongly puberulous externally. Further distinctions from *C. baviensis*, which it approaches the more closely, are given in the diagnosis above.

The genus *Caryodaphnopsis*, together with *Alseodaphne* Nees, *Machilus* Nees, *Nothaphoebe* Bl. and *Stemmatodaphne* Gamble, has recently been reduced by Kostermans (in Journ. Sci. Res. Indonesia, **1**, 151: 1952; Comm. For. Res. Inst. Indon. **57**, 33: March 1957; Reinwardtia **4**, 225: Sept. 1957) to *Persea* Boehm. As, however, his treatment is evidently in some respects provisional, and as *Caryodaphnopsis* does not appear to fit into any of the five subgenera which he recognizes (*ll.cc.* 35, 227: 1957), I prefer for the present to maintain this genus distinct, since it is a clearly defined entity. With his remarks on *facies* (i.e. vegetative characters) I must register friendly disagreement! It may be noted, in passing, that the characters given by Kostermans for his subgenera are by no means mutually exclusive, and that two of the features given for his subgen. *Alseodaphne* (Nees) Benth. (into which he would seem to place *Caryodaphnopsis*), viz. 'stamens with conspicuous filaments, staminodes large', are hardly applicable to the new species here described, in which the filaments are distinguishable only with difficulty and the staminodes are minute.

I take this opportunity of making the necessary transfer of a Bornean plant which I described some years ago (with misgivings) as a *Beilschmiedia*.

Alseodaphne titanophylla (*Airy Shaw*) *Airy Shaw*, comb. nov.
Beilschmiedia titanophylla Airy Shaw in Bull. Misc. Inf., Kew, **1939** 534 (1940).

SARAWAK. *Native Collector* for *Richards* 2438.

Hypericum revolutum Vahl—a forgotten name.—A recent examination of the type of *Hypericum kalmii* Forsk. from SW. Arabia has revealed it to be identical with *H. leucoptychodes* Steud. ex A. Rich. from Tropical Africa. Good (Journ. Bot. **65**, 330: 1927) claimed that the latter was distinct from *H. lanceolatum* Lam., a species with large leaves which was described from Réunion, but large-leaved forms similar to those on the Mascarenes occur in the Uluguru Mts., Tanganyika, and in Nyasaland, where they provide an intergrading series with the small-leaved forms. *H. leucoptychodes*, therefore, cannot be separated from *H. lanceolatum*.

Forskål (Fl. Aegypt.-Arab. CXVIII: 1775) cites *H. kalmii* as No. 469 in his 'Catalogus Plantarum Arabiae Felicis', but his description ('Arboris statura') is insufficient to validate the name. For some reason he omitted it from the 'Descriptiones Plantarum' section of the same work, where most of the species included in the 'Catalogue' are more fully described.

While working through Forskål's collection, Vahl apparently decided that the name *H. kalmii* Forsk. might be confused with that of *H. kalmianum* L., a species from eastern North America. He therefore renamed it *H. revolutum*, citing No. 469 in Forskål's catalogue and adding a fairly complete description of the species (Vahl, Sym. Bot. **1**, 66: 1790). This description fits small-leaved forms of *H. lanceolatum* Lam. well, apart from 'stylus semi-

trifidus'; but this must have been an error of observation as, on examination, Forskål's specimens were both found to have flowers with five styles united for most of their length, the typical condition in *H. lanceolatum*. Thus *H. revolutum* Vahl (1790) must replace *H. lanceolatum* Lam. (1797) as the name of this well-known African species. *H. revolutum* Keller (Engl., Bot. Jahrb. **58**, 194: 1923), a species from Georgia (U.S.A.) belonging to sect. *Myriandra*, is a later homonym of *H. revolutum* Vahl.

Neither Forskål nor Vahl cites the numbers of Foskål's two specimens (No. 792 and 796) and so these must be regarded as syntypes. No. 796 is the more complete specimen of the two and I therefore designate it as the lectotype. The relevant synonymy is as follows:—

Hypericum revolutum Vahl, Symb. Bot. **1**, 66 (1790); Christensen, Dansk Bot. Arkiv. **4** (3), 39 (1922)

Lectotype: 'Arabia felix, in montibus. Marts ? 1763', *Forskål* 796 (C)

Hypericum kalmii Forsk., Fl. Aegypt.-Arab., CXVIII (1775), *nomen nudum.*

Hypericum lanceolatum Lam., Encycl. Bot. **4**, 145 (1797); Oliv., Fl. Trop. Afr. **1**, 156 (1868); Bak. f. in Journ. Linn. Soc., Bot., **40**, 26 (1911); Eyles in Trans. Roy. Soc. S. Afr. **5**, 420 (1916); R. Good in Journ. Bot. **65**, 330, t. 582, fig. 1 (1927); Staner in Bull. Jard. Bot. Brux. **13**, 74 (1934); Robyns, Fl. Parc Nat. Alb. **1**, 620, t. 62 (1948); Perrier de la Bâthie, Fl. Madag., **135**, 3 (1951); Milne-Redh., Fl. Trop. East Afr., Hyperic., 4 (1953) & in Mem. N.Y. Bot. Gard. **8**, 221 (1953); Keay & Milne-Redh., Fl. W. Trop. Afr., ed. 2, **1**, 287, t. 109 (1954). Type: Réunion ['Bourbon'], *Commerson* (LINN-SM, isotype).

Hypericum angustifolium Lam., *loc. cit.* (1797); R. Good, *loc. cit.*, t. 582 fig. 2 (1927). Type: Réunion ('Bourbon'), *Commerson* (K, isotype).

Hypericum leucoptychodes Steud. ex A. Rich., Tent. Fl. Abyss. **1**, 96 (1847); R. Good, *loc. cit.*, t. 582 fig. 3–5 (1927); Norlindh in Bot. Notis. **1934**, 100 (1934); Bredell in Bothalia **3**, 580 (1939); Phillips in Fl. Pl. S. Afr. **20**, t. 787 (1940); Brenan, Check-list Trees & Shrubs Tanganyika Terr. **2**, 249 (1949); Pardy in Rhod. Agr. Journ. **53**, 514, cum tt. 515, 516 (1956). Syntypes: Ethiopia, near Dschenausa, 1 Jan. 1840, *Schimper* 834 (K) & Mt. Bachit., 6 June 1838, *Schimper* 1177 (K).

Hypericum lanuriense De Wild., Pl. Bequaert. **5**, 403 (1932); Robyns, Fl. Parc Nat. Alb. **1**, 622 (1948). Type: Belgian Congo, Ruwenzori, Ruanoli (Lanuri) Valley, *Bequaert* 4460 (BR, holotype).

H. revolutum occurs in SW. Arabia and the mountains of east Africa from Eritrea and Ethiopia to the Cape Province of South Africa, and in the Cameroons and Fernando Po. It is also found in Madagascar, the Comoro Islands and Réunion.

In addition to Forskål's specimens, I have seen the following material of *H. revolutum* from Arabia:—Arabia felix. 'Am Schibam über el Ejan, 2800 m., 2 März 1889', *G. Schweinfurth* 1668 (K); Suda, Asir, 1000 m., 1 July 1956, *Vesey-FitzGerald* 16086/1 (BM); Gebel Soda, 2820 m., 10 Aug. 1952, *Tothill* 135 (BM).

N. K. B. Robson

Notes on Tropical African *Rubiaceae*: I

F. N. Hepper

HEDYOTIDEAE

Tapinopentas Brem. and *Otomeria* Benth.

The genus *Tapinopentas* was published by Bremekamp in 1952 and he carefully compared it with *Chamaepentas*, *Parapentas* and *Pentas*, but not with *Otomeria*, although it seems to me to take an intermediate position between *Pentas* and *Otomeria*. At first *Tapinopentas* was a monotypic genus with *T. cameronica* as the only species. Later (1953) Verdcourt published the names *T. latifolia* and *T. ulugurica* for plants with West and East African distributions respectively. The type specimen of *T. cameronica* is a small-leafed plant, whilst that of *T. latifolia* has much bigger leaves. However, in British Cameroons during January and February 1958, i.e. in the middle of the dry season, I found commonly in shady places a plant which matches the type of *T. latifolia*. Beside dry footpaths and in cut grass (for example in front of the Bafut-Ngemba Rest House, Bamenda, *Hepper* 2083), the leaves of this species became much smaller and more nearly matched the type of *T. cameronica* Brem. I think it reasonable, therefore, to regard *T. cameronica* and *T. latifolia* as synonymous. We must use the name *T. cameronica* due to priority, which is unfortunate in two points: first, that the type specimen is untypical of the species as a whole (if that is not a fundamental contradiction!) and secondly, that the specific epithet is misleading. The Cameroons may be spelt Kamerun or Cameroun but to make the Latin adjective *cameronica* implies a personal name of Cameron or, perhaps, even from the Cameron Highlands in Malaya. However, I am unable to find a loophole in the Code whereby it would be possible to modify the name.

In attempting to make a key to the genera of the tribe *Hedyotideae* for the revision of the 'Flora of West Tropical Africa', Verdcourt's ingenious and excellent key (1953) was most useful. *Tapinopentas* keys out nicely in the group of 'Creeping prostrate herbs with small inflorescences . . . . ' whilst *Otomeria* falls into the group of 'Erect herbs . . . . ' When *Otomeria* and *Tapinopentas* are directly compared, however, I cannot find any valid character to maintain the two genera and, indeed, *Otomeria guineënsis* Benth. is extremely close to *Tapinopentas cameronica*.

I hesitated to sink *Tapinopentas* in view of the thorough revisional work undertaken by Bremekamp and Verdcourt in recent years in *Rubiaceae*. It would be unfortunate to modify more than the minimum necessary, but in notes on specimens at Kew it is obvious that Verdcourt had considerable doubts about the value of *Tapinopentas*. He has kindly agreed to the present modifications.

Otomeria cameronica (*Brem.*) *Hepper*, comb. nov.

Tapinopentas cameronica Brem. in Verh. K. Nederl. Akad. Wetensch., Afd. Natuurk., Sect. 2, **48**, 49 (1952) Type: British Cameroons, *Migeod* 354 (K!, holotype).

T. latifolia Verdc. in Bull. Jard. Bot. Brux. **23**, 60 (1953)

[*Otomeria guineënsis* of Fl. W. Trop. Afr., ed. 1, **2**, 129, partly (*Lloyd Williams* 247; *Dunlap* 140); of Verdc., *l.c.* 14, partly (*A. S. Thomas* D.140), not of Benth.]

[*O. micrantha* (?) of Verdc., *l.c.* 12, partly (*Jones & Onochie in F.H.I.* 18993), not of K. Schum.]

DISTRIBUTION: British & French Cameroons, E. Nigeria, Ghana, Ivory Coast, Sierra Leone.

As I have removed the type of the genus, it seems only reasonable to make a new combination for *T. ulugurica* which Verdcourt 'referred to the genus but with some hesitation.' From mature fruits now available it seems better to place this species in *Pentas* with its obconical fruits rather than in *Otomeria* where the fruits tend to be oblong:

Pentas ulugurica (*Verdc.*) *Hepper*, comb. nov.

Tapinopentas ulugurica Verdc. in Bull. Jard. Bot. Brux. **23**, 60 (1953). TYPE: *Schlieben* 2730 (BR!).

DISTRIBUTION: Known only from the Uluguru Mts., Tanganyika Territory.

A NEW SPECIES IN THE GENUS *PENTAS* BENTH.

Pentas nervosa *Hepper*, sp. nov.; *P. arvensi* Hiern affinis, sed habitu vis pyrophytico differt; *P. zanzibaricae* (Klotzsch) Vatke affinis, foliis subtus reticulato-nervatis, corolla minore differt.

Herba perennis, erecta, ad 80 cm. alta. *Radix* lignescens. *Caules* ± simplicer brunnei subtus 4-sulcati, pauci-ramosi, vix quadrangulares superne dense et pallide pubescenter. *Folia* sessilia, basi cuneata vel ± rotundata, apice acuta, lanceolata vel lanceolata-elliptica, 5–11 × 1·1–2·8 cm., nerviis lateralibus 8–11 utrinque, supra subglabra subtus reticulato-nervosa, dense et minute puberula. *Inflorescentiae* paniculatae, terminales, c. 10 cm. diam. in axillis foliorum terminalum ± ebracteosae. *Flores* subsessiles vel ad 2 mm. ovarium pedicellati, cum calyce minute pallide tomentosi. *Calycis* lobi 5 inaequales, 4 in statu fructifero 0·5–1·5 mm. longis, 1 c. 3 mm. longo. *Corolla* 5-lobata, alba, tubo 4 mm. longo, lobis 1 mm. longis. *Stamina* 5 alternipetala, antheris c. 0·9 mm. longis. *Stylus* c. 4 mm. longus, glaber, apice c. 1 mm. longo bilobus. *Ovarium* 2-loculare. *Semina* subnumerosa, ± angulata, elliptica, reticulata, c. 0·6 mm. longo.

BRITISH CAMEROONS (Northern Trusteeship Territory): Adamawa Div., Vogel Peak area, Sanlingbe c. 1230 m. alt., open upland grassland amongst short grass c. 30 cm. high and herbaceous *Compositae*; plateau crossed by streams in narrow deep gullys, fl. 5 Dec. 1957, *Hepper* 1535 (K, holotype, BR, FHI, P, isotypes):—erect stout herb c. 80 cm. high with thick rootstock; stem 4-grooved; leaves with slightly raised nerves in small depressions above, prominent-reticulated beneath; corolla white, tinged mauve; hairs in throat darker mauve; anthers deep mauve.

I am very grateful to Dr. B. Verdcourt for his opinion on this plant which was quite unknown to him. It falls between *P. arvensis* Hiern and *P. zanzibarica* (Klotzsch) Vatke. The non-pyrophytic habit excludes it from the former, and the smaller, white flowers from the latter. The marked reticulation on the undersurface of the leaves is not characteristic of either species. An odd specimen from Acholi, Uganda (*Dawe* 855), cited as *P. arvensis* Hiern by Verdcourt, may possibly also be *P. nervosa*. Unfortunately it has no base to the stem and it is difficult to be sure whether it is a pyrophyte or not,

although the collector's notes read 'an erect pubescent perennial woody at base of stem'.

MUSSAENDEAE

Since the publication of my paper on *Sabicea* (Kew Bull. **13**, 289: 1958) another new species of *Sabicea* has turned up in the recent collections at Kew and is described below.

Sabicea neglecta *Hepper*, sp. nov.; *S. cordatae* Hutch. & Dalz. affinis, inflorescentiae structura et bractearum cupula patenti, foliis apice caudatis differt; a *S. speciosa* K. Schum. floribus brevus pedunculatis in axillis folium dispositis (i.e. planta haud cauliflora) distincta.

Frutex volubilis ramulis tenuibus dense patento-pilosis. *Folia* elliptica vel oblanceolata, 10–17 × 3–7 cm., basi cuneata (vel rotundata), apice caudata vel acuminata, supra parce pilosa, nervis lateralibus c. 11 subtus pilosis; petiolo 1–1·5 cm. longo piloso; stipulis late-ovatis, 7–12 diam. extra pilosis. *Flores* 3 in capitulo axillari (an semper?); pedunculo 2–4 mm. longo; bracteis cohaerentibus et cupulam formantibus, ad 1·5 cm. latis, bracteolis lineari-lanceolatis. *Calycis* lobi 5, linearibus, c. 11 × 1 mm., pilosis ovarium cum calyce c. 6 mm. longum densissime pilosum. *Corolla* extra dense pilosa, tubo c. 24 mm. longo, lobis 2 mm. longis, rubris; stylus 5-lobus. *Fructus* ignotus.

E. Nigeria: Calabar Prov., Oban group Forest Reserve, Okarara, in high forest, fl. May 1952, *E. Ujor in F.H.I.* 30836 (K!, holotype):—climber; flowers red.

S. neglecta at first sight looks like *S. cordata* Hutch. & Dalz., but the long-acuminate apices to the leaves and several-flowered inflorescences serve to distinguish it very easily. It is also near *S. speciosa* K. Schum., but this is cauliflorous and lacks the caudate leaf-tips.

Sabicea adamsii *Hepper* in Kew Bull. **13**, 291 (1958)

Two more specimens have extended our knowledge of the distribution of this species since it was described. The original gathering came from Ghana and the species was apparently endemic to that country. However, I have since found amongst the indeterminates at the end of *Rubiaceae* at Kew a sheet of the same species gathered by Tessman in Spanish Guinea with the following data:—

Spanish Guinea: Nkolentangan (hinterland), bei der Station, Nov. 1907, *Tessmann* 3 (K!):— blüte weiss; vernacular name 'elóamakok'.

Recently E. Petit of Brussels, on seeing my illustration in Kew Bulletin, sent a further gathering from the Belgian Congo:—

Belgian Congo: Léopoldville Prov., Boma Territ., Temvo, fr. Apr. 1919, *Vermoesen* 1931!

SPERMACOCEAE

Some notes on certain De Candolle types

Although the loan of specimens from the De Candolle Herbarium, Geneva, is not permitted, the Director was kind enough to arrange for photographs of five types to be sent to me at Kew. They were photographs of *Spermacoce chaetocephala* DC., *S. stachydea* DC., *S. phyllocephala* DC., *S.*

galeopsidis DC. and *S. palmetorum* DC., all of which have been neglected or mis-interpreted in the past. The following notes are based on my observations of the photographs, together with De Candolle's descriptions, and the relevant West African collections at Kew.

1. **Borreria chaetocephala** (*DC.*) *Hepper* var. **chaetocephala**

Spermacoce chaetocephala DC., Prodr. **4**, 554 (1830). TYPE: Senegal: Bakel, Sept. 1828, *Leprieur* [*& Perrottet*] (G, holotype, K!, photo.).

S. hebecarpa (Hochst. ex A. Rich.) Oliv. var. *major* Schweinf. ex Hiern in Fl. Trop. Afr. **3**, 236 (1877), non *S. hebecarpa* DC. (1830). TYPE: *Schweinfurth* 1479 (K!, isotype)

DISTRIBUTION: Senegal, French Sudan, N. Nigeria.

Borreria chaetocephala var. **minor** *Hepper*, var. nov.

B. hebecarpa Hochst. ex A. Rich., Tent. Fl. Abyss. **1**, 347 (1848). TYPE: Ethiopia, *Schimper* 1712 (K!)

DISTRIBUTION: N. Nigeria, Sudan, Ethiopia.

The rules of priority in the 'International Code of Botanical Nomenclature' necessitate a complete change round so that what was previously the variety has to take a specific name and what was previously a species must now take a varietal name. I have coined a new name for the latter—*minor*—(as I am under no obligation to use the epithet *hebecarpa*) to distinguish it more easily from what has been known previously as var. *major*.

2. **Borreria stachydea** (*DC.*) *Hutch. & Dalz.* is based upon *Spermacoce stachydea* DC., Prodr. **4**, 554 (1830), which was entered in the 'Flora of Tropical Africa' with a query and a note that Hiern had not seen the type specimen. I now find from excellent photographs of the type that it matches *S. leucadea* Hochst. ex Hiern (1877). It will now be necessary to treat the latter name as a synonym of *B. stachydea* (DC.) Hutch. & Dalz.

3. **Borreria stachydea** (*DC.*) *Hutch. & Dalz.* var. **phyllocephala** (*DC.*) *Hepper*, comb. et stat. nov.

Spermacoce phyllocephala DC., Prodr. **4**, 553 (1830). TYPE: Senegal, Kouma, *Perrottet & Leprieur* (G, holotype, K! photo.)

The type appears to be a glabrous variety of *B. stachydea* (DC.) Hutch. & Dalz. and the new combination is made above.

I have had on loan from Paris two sheets of a similar plant misleadingly named '*Spermacoce galeopsidis* DC.' followed by '?' and '*S. Ruelliae* var. *glabra* Nob.' on one specimen written in a hand-writing with which I am not familiar. However, neither sheet is true *Spermacoce galeopsidis* DC. but *S. phyllocephala* DC., and it is unwise to assume that named plants at Paris, which are apparently duplicates of those De Candolle described, are types.

4. **Spermacoce galeopsidis** *DC.*, Prodr. **4**, 554 (1830), must remain for the moment as an imperfectly known species as I am unable to be sure of the plant from a photograph of the type. The plant is 'densely covered by stiff, short pubescence, which is mixed with longer ones' according to a letter received recently from Geneva. TYPE: Senegal, Dagana, *Leprieur & Perrottet* (G, holotype, K!, photo.).

5. **Spermacoce palmetorum** *DC.*, Prodr. **4**, 553 (1830), clearly appears from the photograph of the type to be the plant known in West Africa as *Diodia scandens* Swartz (*D. breviseta* Benth.). It has hitherto also been known as *Spermacoce pilosa* (Schumach. & Thonn.) DC. and I have seen Thonning's gathering of this, kindly loaned by the Botanical Museum, Copenhagen. In the first edition of the 'Flora of West Tropical Africa' *S. pilosa* and *D. scandens* were kept apart on the mode of dehiscence of their fruits. However, on looking into this for the revised edition, I have come to the conclusion that there is but one species (and indeed one genus) concerned here. The few specimens at Kew under *Spermacoce pilosa* were mostly less mature than very similar specimens under *Diodia scandens* and the septum of each fruit does not split when immature. Ripe fruits separate easily into two halves each having its own entire part of the septum—hence these were determined as *Diodia*. TYPE: Senegal, Cayor, *Perrottet & Leprieur* (G, holotype, K!, photo.).

SOME WEST AFRICAN *BORRERIA* SPECIES

The following notes have resulted from a study of *Borreria* for the revised edition of the 'Flora of West Tropical Africa'.

Borreria intricans *Hepper*, sp. nov.; affinis *B. princeae* K. Schum., sed stipulis vaginantibus et calyce breviori differt.

[*Spermacoce phyllocephala* ? of Benth. in Hook., Fl. Nigrit. 423 (1849), and Hiern in Fl. Trop. Afr. **3**, 240, as to G. Don's specimen from Sierra Leone, not of DC.]

Herba annua 20–30 cm. alta, ramosa. *Radix* fibrosa. *Caulis* subquadrangularis superne angulis subalatis ciliatis. *Stipulae* vaginatae ± pilosae, 2–3 mm. longae, utrinque setis c. 2 2–3 mm. longis instructae. *Folia* ovata basi acuminata, apice longe acuminata; lamina 2·5–5·5 × 1·5–3 cm., supra subglabra haud scabra, subtus glabra. *Inflorescentia* sessilis, flores pauci in omnibus axillis. *Calyx* 5-lobus, lobis 1·5 mm. longis, extra pilosis (pilis pluricellulatis). *Corolla* 6 mm. longa, 4-loba, alba, lobis apice 2 vel 3 pilis instructis. *Stamina* 4 exsertis, filamentis corollae tubo exacte in spatio loborum affixis. *Ovarium* 2-loculare, apice 2-lobum, stylo exserto 7 mm. longo, stigmate capitato subbilobo, loculis 1-ovulatis. *Capsula* matura 5 mm. longa; semina 4·5 mm. longa, castanea.

GUINEA REPUBLIC: Bafing, fr. Oct. 1956. *J. G. Adam* 12655 (K!).

SIERRA LEONE: Colony: without locality, *G. Don* (BM!). Sugar-loaf Mt., 300 m. alt., on mossy rocks common along pipe-line above Regent, fl. & fr. Nov. 1951, *Deighton* 5624 (K!):—white flowers. Northern Province: Tonkolili Dist.: Yonibana, fr. Oct. 1914, *N. W. Thomas* 4133 (K!):—Mende name 'bwambi'; Mamaka, fr. Nov. 1914, *N. W. Thomas* 4370; 4622 (K!):—Mende name 'mbaku'. Bumbuna, fl. & fr. Oct. 1914, *N. W. Thomas* 3243 (K!). Koinadugu Dist., Loma Mts., galerie forêt d'altitude du massif du Bintumane, fr. Nov. 1944, *Jaeger* 539 (K!). South-western Province: Bo Dist., Gbo Chiefdom, Baiima, abundant at edge of hammock road through bush, fl. & fr. Sept. 1935, *Deighton* 3054 (K! holotype):—white flowers.

IVORY COAST: Tonkoui Mt., fl. Sept. 1955, *Aké-Assi* s.n. (IA!).

For more than a century Don's specimen of a *Borreria* in the fruiting condition has lain in the British Museum only tentatively labelled '*Spermacoce phyllocephala* DC.?' At Kew there are several sheets from Sierra Leone and Guinea Republic of a plant that matches Don's specimen. De Candolle's description certainly does not fit these specimens and I have been unable to

find a published name for the species. At Kew one specimen had also been confused with *Parapentas setigera* (Hiern) Verdc. (=*Virecta setigera* Hiern) but, as Verdcourt pointed out, it possesses one seed per loculus which excludes it from the *Hedyotideae*. I have called it *B. intricans* because of this confusion (*Lat.* confusing). The relationship of this species with others in *Borreria* is not yet clear and it does not seem to be very close to any other West African species. The forest habitat is unusual in this genus with so many species that are characteristic of open places. *B. princeae* K. Schum., however, grows in the more open parts of montane forest but it is not closely related to *B. intricans*. Although this species is now described for the first time it appears to be fairly common in Sierra Leone and has also been collected in Guinea Republic and in Ivory Coast: there is no doubt it also occurs in Liberia.

Borreria macrantha *Hepper*, sp. nov.; incertae cedis quoad sectionem generis; a ceteris speci bus corollae tubo maximo faciliter distinguenda.

Herba perennis. *Caules* subsimplices, divaricati, 40–50 cm. longi, pubescentes vel pilosi, internodis saepe 10 cm. longis. *Stipulae* vaginatae, pilosae 5 mm. longae, setis ad 6 mm. longis instructae. *Folia* lanceolata 4–5 cm. longa, 9–15 mm. lata, subsessilia, apice acuta, utroque latere 4–5-nervia, supra nervis impressis, scabra, utrinque pilosa. *Flores* in axillis aggregati. *Calyx* 4-lobus, 8 mm. longus, lobis subaequalibus margine hyalinus, carinatis hispidus. *Corolla* tubo 4·5 cm. longo, lobis 4, 9·5 mm. longis pilosis supra, alba vel violacea. *Stamina* 4, antheris 2·5 mm. longis. *Ovarium* subbilobum, stylo exserto capitato subbilobo. *Fructus* non vidi.

var. **macrantha**

Guinea Republic: Macenta, open rocky hill, c. 300–770 m. alt., fl. Oct. 1947, *Baldwin* 9780 (K!):—flowers white, tinged with violet; stems lax to 100–130 cm. high ; common.

Sierra Leone: Northern Province, Koinadugu Dist., Loma Mts., prairie d'altitude c. 1,400 m., fl. Sept. 1945, *Jaeger* 1433 (K!).

Ivory Coast: Nimba Mts., fl. Sept. 1942, *Schnell* 1852 (K!). Nimba Mts., in grassland, c. 770–1530 m. alt., fl. Aug. 1954, *Boughey* GC 18077 (holotype K!).Nimba Mts., in *Syzygium* savanna, c. 615 m. alt., fl. Aug. 1954, *Boughey* GC 18157 (K!). Tiapleu, rocks, fl. Sept. 1955, *Aké-Assi* 3286 (IA!). Tonkoui Mt., Sept. 1949, *Aké-Assi* 4859 (IA!).

The relationship of this large-flowered *Borreria* is obscure but it is so distinct that it can hardly be mistaken. A sterile specimen, however, might be taken for *B. scabra* (Schumach. & Thonn.) K. Schum. with very lax branches.

A completely glabrous plant from Guinea Republic is otherwise very similar to *B. macrantha* and is here described as a variety of it.

var. **glabra** *Hepper*, var. nov.; var. *macranthae* similis, sed tota planta glabra.

Guinea Republic: Nzérékoré, Mt. Kiore, c. 770 m. alt., fl. Sept. 1949, *J. T. Baldwin Jr.* 13299 (holotype K!):—flowers white.

The leaf-margins are scabrid, but the surface is quite smooth, and the calyx-lobes are serrulate or stiffly ciliate.

Borreria compressa *Hutch. & Dalz.*, Fl. W. Trop. Afr., ed. 1, **2**, 135 (1931)

This must be regarded as a new name by Hutchinson & Dalziel in *Borreria*, rather than a new combination as it was intended to be. The basonym is *Spermacoce compressa* Afzel. ex Hiern (1877), but unfortunately this is a later homonym of *S. compressa* Wall. ex G. Don (1834).

Berhaut when he was preparing his 'Flore du Sénégal' recognised that there are small- and large-flowered plants amongst material normally determined as *B. compressa*. To the small-flowered plants he gave the name *B. velorensis* Berh. but invalidly published the description in French in his Flora. (1954). However, there is nothing lost since the type of *B. compressa* (*Afzelius* s.n., BM!) also has small flowers about 5 mm. long and Berhaut's name would have been superfluous. The large-flowered plants with corollas about 15 mm. long (e.g. *Deighton* 1229; *N. W. Thomas* 2731, both from Sierra Leone) I feel are not sufficiently distinct to merit a separate name. Also confused with *B. compressa* are some specimens at Kew which have very small flowers and minute calyx-lobes: these I am separating as *B. paludosa* described below.

Borreria paludosa *Hepper*, sp. nov.; affinis *B. compressae* Hutch. & Dalz., sed corollis calycis capsulisque minoribus differt.

Herba annua, glabra, ad 50 cm. alta. *Radix* fibrosa. *Caulis* haud tetragonus sulcatus in sicco, glaber, ramosus vel subsimplex. *Stipulae* vaginatae 3–5 mm. longae, setis 2–3 mm. longis, glabris. *Folia* linearia vel linearilanceolata, 4–6 cm. longa, 4–9 mm. lata, supra scabrida, apice acuta, basi subsessilia. *Flores* in axillis congestae. *Calyx* 4-lobus, lobis minutis. *Corolla* 4-loba, rosea, tubo 1·5 mm. longo, lobis 1 mm. longis, glabris. *Stamina* 4. *Stigma* subcapitata. *Semina* 2, castanea, 2 mm. longa.

Spermacoce compressa Afzel. ex Hiern in Fl. Trop. Afr. **3**, 235 (1877), partly (*Barter* 1231), not of R. Br.

Borreria compressa Hutch. & Dalz., Fl. W. Trop. Afr., ed. 1, **2**: 135 (1931), partly (*Barter* 1231, *Scott Elliot* 5264).

Guinea Republic: R. Dantilia [= Dentilia], muddy places, fl. & fr. Mar. 1892, *Scott Elliot* 5264 (K!).

Sierra Leone: Northern Prov.: Kambia Dist., Magbema, at edge of dried-up rockpool, fl. & fr. Mar. 1951, *Jordan* 433 (K!):—flowers pink. Same locality, by edge of dry stream, fl. & fr. May 1953, *Jordan* 873 (holotype K!):—flowers pink.

Northern Nigeria: Bida Prov., Nupe country, moist ground, 1857, *Barter* 1231 (K!):—flowers pale lilac.

Eastern Nigeria: Ogòja Prov., Ndibi, Afikpo, weed in alluvial farmland near edge of lake, fl. & fr. June 1955, *R. H. Stone* 9 (K!).

B. paludosa has very small flowers and minute calyx-lobes and on these characters it is clearly separable from *B. compressa* Hutch. & Dalz. with which it has been confused. The species seems to be quite widespread although the present known distribution is rather discontinuous.

Borreria princeae *K. Schum.* var. **pubescens** *Hepper*, var. nov.; typi similis, sed dense pubescens.

Fernando Po: Moka, in grassland, c. 1230 m. alt., fl. Dec. 1951, *Boughey* 32 (K!, holotype).

British Cameroons: Victoria Prov., Cameroon Mt., in montane forest c. 1230 m. alt., fl. Sept. 1946, *Dundas in F.H.I.* 15316 (FHI!, K!).

Uganda: Western Prov., Kigezi, Kachwekano Farm, frequent in temporary ley plots, 2210 m. alt., fl. & fr. Apr. 1949, *Purseglove* 2727 (K!):—partially procumbent herb; small axillary white flowers; 'ensizi' (Lukiga). Toro, 1530 m. alt., *Snowden* 64 (K!):—herb, c. 60 cm.; flowers small, white. Ruwenzori, Salt Lake, fl. & fr. July, *Scott Elliot* 7951 (K!). Ibanda Hill, 1230 m. alt., fl. & fr. Aug. 1931, *Fishlock & Hancock* 206 (K!):—herb 15 cm. high; flowers white. Mihunga, in grassland, 1880 m. alt., fl. & fr. Jan. 1939, *Loveridge* 339 (K!):—plant 40 cm. high; flower white. Kigezi, Kashambya, Kisisi road, mile 40, 1396 m.

alt., roadside edge of swamp beside sterile patch of shallow peat on clay, fl. & fr. May 1952, *Norman* 105 (K!):—semi-decumbent herb, spreading 25–30 cm. and rising to as much; flowers white; Lukiga name 'tawatara'. Kigezi, Bufumira, roadside, 2030 m. alt., fl. & fr. Sept. 1946, *Purseglove* 2126 (K!):—common rather straggling herb; flowers white; L'ruanda name 'ngingo-igana'. Lake Bunyoni, on rather dry bank, 2030 m. alt., June 1952, *Lind* 6 (K!):—single axillary flowers, white, tubular, 4 petals. Toro, Kisomoro, grassland, fl. & fr. Mar. 1932, *Hazel* 206 (K!):—30–45 cm high; flowers white. Buganda Prov., Mengo Dist., Bukalasa, fl. & fr. Sept. 1927, *Staples* 1243 (K!). Sese, Bugala, marshy ground beside lake, 1170 m. alt., June 1932, *A. S. Thomas* 181 (K!):—frequent, procumbent; flowers small white.

Kenya: Central Prov., Mara R., 1900 m. alt., Jan. 1940, *Copley in Bally* 637 (K!). Nyanza Prov., Sotik, in rough grassland with *Tagetes*, June 1953, *Verdcourt* 947 (K!):—sprawler with 3–4-merous, white flowers. South-western Mau F.R., camp 7, edge of tall dense forest with *Conopharyngia holstii* and *Neoboutonia macrocalyx*, 2120 m. alt., Aug. 1949, *Maas Geesteranus* 5670 (K!):—prostrate-ascending herb; leaves dark green; flowers white; frequent.

Tanganyika: Bukoba Dist., Maruku, in grassland, 1320 m. alt., *Panayotis & G. K. R. Williams* 95 (K!):—flowers white. Ufipa Dist., Chapota, steep moist bank among rocks in forest shade, 1700 m. alt., fl. & fr. Dec. 1949, *Bullock* 2002 (K!):—weak-stemmed herb; flowers white. Iringa Dist., Ilongelo, 2000 m. alt., Mar. 1954, *Carmichael* 405 (K!):—herb 60 cm.; stem reddish; leaves pubescent, rough; flowers with 4 white petals.

At Kew some of the above specimens had been named '*Diodia scandens* Swartz' but they are separable from that species by the larger fruit and its mode of dehiscence and larger flowers. Others had been determined as *Borreria princeae* K. Schum. and later separated into an unnamed 'sp.' cover. Although they have a characteristic appearance I think that a rank above variety is not warranted as they appear to differ from *B. princeae* K. Schum. only in their pubescence. Typical *B. princeae* is slightly hairy but there is little gradation between the two varieties.

The genus *Octodon* Thonning

While constructing a key to the genera of the *Spermacoceae* for the revised edition of the 'Flora of West Tropical Africa' I found that *Octodon* was difficult to separate from *Borreria*.

In the first edition *Borreria* was separated merely on the character of 'calyx-teeth subulate or lanceolate' against 'calyx-teeth rounded' for *Octodon*. A similar distinction was used in the 'Flora of Tropical Africa'.

Verdcourt (in Bull. Jard. Bot. Brux. **23**, 251: 1953) separated the two genera thus:

Calyx 4—8-toothed, flowers mixed with filamentous bracts in involucrate capitula . . . . . *Octodon*
Calyx 4-toothed, flowers not mixed with filaments . . . . *Borreria*

There are only two species published in *Octodon* and these are similar to each other, whilst *Borreria* is a vast genus. The number of calyx-teeth is not a valid distinction and several species of *Borreria* possess filamentous bracteoles, e.g. *B. stricta* (L.f.) K. Schum.

The facies of *Octodon* with its sheathing stipules at the base of spreading bracts seems quite distinctive, but *Borreria dibrachiata* (Oliv.) K. Schum. in East Africa presents the same aspect. Indeed many species of *Borreria* approach this characteristic to some degree and nowhere can a clear-cut line of distinction be drawn.

K. Schumann's treatment of *Borreria* (in Engl. & Prantl, Pflanzenfam. **4** 4), 143–4) as long ago as 1891 seems to have been overlooked. In it he

simply stated that the two species of *Octodon* belonged there and made the new combinations. I am entirely in agreement with this view although I regret to see the passing of *Octodon*!

The Fungi of cultivated plants.*—The greater part of Mr. Moore's book is occupied by an alphabetical annotated list of a little over 1000 species, varieties and forms of fungi, actinomycetes and myxomycetes recorded as parasitic on or otherwise injurious to economic plants in the British Isles. As such it is basically a summary of Ministry of Agriculture Misc. Publ. 21, 23, 33, 38, 52 and 70 and Bull. 79, 126 and 139 with additions culled from the literature. It will largely replace Ainsworth's 'The Plant Diseases of Great Britain' 1937 which, however, attempted to list Bacterial diseases, Virus diseases and troubles of nonparasitic origin as well as those associated with fungi. There is also a host list, under about 500 names.

Closer cooperation between the Plant Pathological laboratory and the Royal Botanic Gardens might have resulted in even more up to date information being compiled. Mr. Moore is apparently unaware, for example, that the aecidial state of *Uromyces striatus* Schröt was collected on *Euphorbia cyparissias* in Suffolk in 1957 or that this rust occurs sporadically in south-east England on the important economic host *Medicago sativa*.

R. W. G. Dennis

The diseased plant.**—The primary problem facing a pathologist is correct diagnosis. Hence most practical manuals of plant pathology are mainly concerned with describing and illustrating individual diseases and their matter is classified either under the agents associated with disease or under the plants affected. It does not follow, as Messrs. Horsfall & Dimond seem to assume, that experienced plant pathologists are content once a pathogen or presumed pathogen has been observed to be associated with a diseased condition in a plant. Experience soon shows that disease is a more complex problem than a simple interaction of host and parasite. Nevertheless there is room for a modern summary of such information as has accumulated regarding the physiological disturbances which occur in diseased plants, even though the work may prove more helpful to plant physiologists than to practising pathologists. The editors of this manual have collected essays by distinguished specialists on important aspects of disease as it affects individual plants and crops. After introductory and historical chapters contributed by J. G. Ten Houten and G. W. Keitt, K. Starr Chester describes methods and uses of plant disease measurement, in individuals and in plant populations. A. Husain & A. Kelman discuss the nature of disintegration

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* *British parasitic fungi*. By W. C. Moore. Pp. xvi + 430, 1 map. Cambridge: The University Press, 1959. Price £2 5s.

***Plant Pathology—An Advanced Treatise*. Vol. 1. The Diseased Plant. Edited by J. G. Horsfall & A. E. Dimond. Pp. xiv + 674, 46 text-figures, 14 tables. New York and London: Academic Press, 1959. Price $22.00.

in cells and tissues. Pathological responses in plant growth are dealt with by A. C. Braun, who classifies them initially into harmonious and amorphous changes, the latter including self limiting (galls) and nonself limiting (tumours) responses. A. Ciccarone contributes a useful summary of recent advances towards an understanding of the influence of environmental factors on initiation and functioning of flowers and on the setting and maturation of fruit, with special reference to fruit trees. C. Sempio discusses some aspects of nutrition in plants infected by obligate parasites. Recent papers on water balance in healthy plants and imbalance which arises in diseased plants with the consequent functional disorders are summarised by D. Subramanian and L. Saraswathi-Devi, with reference especially to *Fusarium*-induced wilts. Ikuzo Uritani and Takashi Akazawa describe alterations in the respiratory pattern in infected plants. Defensive phenomena in plants are discussed from the histological and cytological viewpoints by S. Akai who distinguishes especially between barriers to penetration existing prior to infection and defence structures which appear in tissues in response to pathological invasion. The physiology and biochemistry of defence are described by P. J. Allen while K. O. Müller writes of Hypersensitivity. C. E. Yarwood shows how the age of plants and the conditions under which they grow affect their susceptibility to disease. A final chapter on physical and chemical therapy of individual diseased plants is contributed by F. L. Howard and J. G. Horsfall.

R. W. G. Dennis

Vegetation of Salvador.*—Salvador, situated on the Pacific coast between Guatemala and Honduras, is the smallest and most densely populated of the Central American republics. At the same time it is a purely agrarian country, with the result that the natural vegetation has been nearly destroyed and is reduced to small relict areas. The botanical investigation of Salvador is still in its infancy: an illustrated, official 'Flora Salvadoreña', 1926–[1932?], consisted of five volumes of photographs, with brief text, of a large number of selected species; and a preliminary list of the flora, with two supplements, by P. C. Standley and Salvador Calderón, was published in 1925–1927, with a second edition in 1941. This essay, then, is of value as it gives the first complete scientific description (prepared between October, 1952, and August, 1953) of the topography, climate and vegetation types of Salvador, accompanied by a bibliography and a number of photographs. The primary classification of the vegetation is by three altitudinal zones: *tierra caliente*, 0–800(1000) m.; *tierra templada*, 800(1000)–1800(2000) m.; and *tierra fria*, above 1800(2000) m. The first two of these are then divided into primary and secondary vegetation types, with their various subdivisions, while the highest zone has two primary types, evergreen cloud-forest and Ericaceous 'Windbusch'.

N. Y. Sandwith

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* *Vegetation und Standortsklima in El Salvador, eine Pflanzengeographisch-Ökologische Studie.* By Wilhelm Lötschert, being Heft 10 of Botanische Studien, edited by W. Troll & H. von Guttenberg. Pp. viii + 88, 38 figures, 20 photographs. Jena: V. E. B. Gustav Fischer, 1959. Price DM. 14.30.

The genera *Sarcochilus* R. Br. and *Pteroceras* Hassk. *(Orchidaceae)* with notes on other genera which have been included in *Sarcochilus*

R. E. Holttum

The genus *Sarcochilus*, established by Robert Brown in 1810 for a single Australian species, *S. falcatus*, was later made to include a very heterogeneous mixture of other species. The work of distinguishing natural genera among such of these species as occur in Malaysia was largely accomplished by the late J. J. Smith. In so doing he restricted the use of the name *Sarcochilus* to a particular group of Malaysian species with which Bentham and others had associated *S. falcatus* R.Br. In the preparation of my book on the Orchids of Malaya (1953) I also used the name *Sarcochilus* in this sense. Recently however V. S. Summerhayes called my attention to the fact that *S. falcatus* differs in some respects from the Malaysian orchids which Smith and I have included in the genus *Sarcochilus*. I therefore examined living plants of *S. falcatus* and also of two other Australian species in cultivation at Kew, and agree with Summerhayes that they are generically distinct from the Malaysian species in question. The present paper is an attempt to characterize the two genera and to establish the correct generic name for the Malaysian species; also to typify the various other genera which at one time or another have been included in *Sarcochilus* and to give an opinion on their status.

The history of the various ways in which the generic name *Sarcochilus* has been used is complex, and a historical introduction is necessary to clarify the situation. The history begins with the year 1790, when Loureiro established the genus *Thrixspermum* (Fl. Cochin. 519), describing the species *T. centipeda*. As above noted, Robert Brown established *Sarcochilus*, with the single species *S. falcatus*, in 1810 (Prodr. Fl. N. Holl. 332). Blume established *Dendrocolla* in 1825 (Bijdr. Fl. Ned. Ind. 286), describing many species, arranged in three sections *Cuculla*, *Tubera* and *Fornicaria*. These three botanists were dealing, as pioneers, with the floras of separate geographic areas. When Lindley came to make a survey of the whole Orchid family (Gen. & Sp. Orch. Pl., 1830–1840), he saw no specimens of the original species of *Thrixspermum*, and placed the genus in a postscript of doubtful names; of *Sarcochilus falcatus* he saw a poor specimen, from which he could not well judge its place in his scheme (he placed it quite apart from the other Sarcanthine genera with which it belongs); and he united *Dendrocolla* Bl. with *Aërides* Lour. Lindley later saw living plants of *Sarcochilus falcatus* and published an illustration and a generic description (Bot. Reg. **22**, t. 1832: 1836); but later he described a new species *S. calceolus* (Bot. Reg. **32**, t. 19: 1846) which is closely allied to the species of *Dendrocolla* sect. *Cuculla* Bl., to which he made no reference.

H. G. Reichenbach was the next author to deal with the orchid family as a whole. He had established a genus *Orsidice* in 1854 (Bonplandia **2**, 93), remarking that it was closely related to *Dendrocolla*. When he came to his

wider survey, he united the following genera under *Sarcochilus*: *Chiloschista* Lindl., *Gunnia* Lindl., *Dendrocolla* Bl., *Ornitharium* Lindl. & Paxt., *Pteroceras* Hassk. and *Orsidice* Rchb.f. (Walp., Ann. **6**, 497: 1863). But soon afterwards, when looking for types of Loureiro's species at the British Museum, he discovered a specimen of *Thrixspermum centipeda*, and saw that it was very near to species assigned to *Dendrocolla* sect. *Cuculla* by Blume; Reichenbach therefore united all the above genera in *Thrixspermum* (Xen. Orch. **2**, 121: 1867), but he kept separate his own genus *Grosourdya*, species of which were later transferred to *Sarcochilus* by other authors.

G. Bentham (in Genera Plantarum **3**, 575: 1883) followed Reichenbach's concept of a very comprehensive genus (adding also *Grosourdya* Rchb.f., *Cylindrochilus* Thw., *Micropera* Lindl., *Camarotis* Lindl. and *Micropera* Dalz.), but called it *Sarcochilus* because he considered that the name *Thrixspermum* was badly formed; he stated also that there was another genus, *Trichosperma* Bl., the name of which was formed from the same Greek words. Bentham included the original Australian species of *Sarcochilus* and its allies under sect. *Tubera* (which he adopted from Blume and used as a sectional name in *Sarcochilus*). Pfitzer (in Engl., Pflanzenfam. II. **6**, 218: 1889) also followed Bentham in adopting the name *Sarcochilus*, separating some small groups as distinct genera.

J. D. Hooker, in his account of Indian orchids (Fl. Br. Ind. **6**, 33: 1890) likewise adopted the name *Sarcochilus*, and included in the genus almost all that Bentham had included (excluding only *Micropera* Dalz., which he transferred to *Saccolabium*); but he called it 'a polymorphous genus, no doubt to be dismembered when better known'. He was of course not concerned with the original Australian species of *Sarcochilus*, but meanwhile other Australian species, allied to *S. falcatus* R.Br., were described by von Mueller and other botanists.

O. Kuntze objected to the substitution of the name *Sarcochilus* for the older *Thrixspermum* (Rev. Gen. Pl. **2**, 681: 1891) and transferred Hooker's new names in *Sarcochilus* to *Thrixspermum* (most earlier ones had been transferred by Reichenbach), but he made no new taxonomic observations.

As soon as the taxonomy of this group of orchids was considered by field botanists, who had ample material of fresh flowers for examination, the dismemberment of Hooker's polymorphous genus began. Ridley, working in Malaya, was the first to comment on the problem (Journ. Linn. Soc. Bot. **32**, 347: 1896). He recognized that *Dendrocolla* sect. *Cuculla* Bl. was congeneric with the original species of *Thrixspermum*, and restricted Loureiro's name to that group of species. He retained the name *Sarcochilus* for Blume's sect. *Tubera*, thus following Bentham; he said that such a genus included 'all the species with a long foot to the column with a small often fleshy epichil'. Ridley considered that Blume's third section *Fornicaria* represented a third good genus, and he restricted the name *Dendrocolla* Bl. to this section (*l.c.*, p. 380).

J. J. Smith, studying at Bogor a large series of living plants (as well as specimens in alcohol) brought from many parts of Malaysia, agreed with Ridley in uniting *Dendrocolla* sect. *Cuculla* with *Thrixspermum*, but pointed out that the species of sect. *Fornicaria* agreed also with *Thrixspermum* in essential floral structure (they differ from sect. *Cuculla* in having spirally arranged

small bracts). Smith accordingly ranked *Dendrocolla* sect. *Fornicaria* as a second section of *Thrixspermum*, using the name *Dendrocolla* for this section (Fl. Buit. **6**, Die Orchideen von Java, Preface p. vii: 1905). R. Schlechter agreed with this procedure, but proposed a third section *Katocolla* in which he placed two species from Blume's section *Fornicaria* and also two more of his own (Orchis **5**, 46–48, 54–58: 1912). He still however adopted a very broad view of *Sarcochilus*, including in it the genera *Chiloschista*, *Cylindrochilus*, *Grosourdya*, *Micropera* Lindl., *Gunnia* Lindl., *Ornitharium* Lindl. & Paxt., *Pteroceras* Hassk. and *Stereochilus* Lindl. (Die Orchideen 540: 1914); but neither in the book just quoted nor elsewhere did Schlechter give a clear diagnosis of the genus *Sarcochilus*.

Thus, according to both Smith and Schlechter, Blume's genus *Dendrocolla* is in part to be united to *Thrixspermum*, in part to *Sarcochilus*, both these names having priority over *Dendrocolla*. So far as *Thrixspermum* is concerned, I concur in this judgement, though *Dendrocolla* sect. *Fornicaria* appears to form a quite distinct group which might not unreasonably also rank as a genus, according to Ridley's practice; for such a genus, the name *Dendrocolla* is available. But though Smith and Schlechter united *Dendrocolla* sect. *Tubera* with *Sarcochilus*, it does not appear that either of them made a critical comparison of the Malaysian and Australian species concerned. Such an attempt was made for the allied species of Sikkim by King & Pantling (Ann. R. Bot. Gard. Calc. **8**: 1898), but they were only partially successful, perhaps because they did not have fresh flowers of Australian species for examination.

King & Pantling, like Ridley, Smith and Schlechter, recognized the composite nature of *Sarcochilus* sensu Bentham. They adopted the name *Dendrocolla* for Blume's sect. *Cuculla* (not referring to Ridley's restriction of that name to sect. *Fornicaria*), probably because they followed Bentham in considering the name *Thrixspermum* not usable. They correctly stated that Blume's sect. *Tubera* was something quite different from *Sarcochilus* R.Br., and for a species closely related to one of Blume's in that section they used the name *Ornitharium striatulum* Lindl. & Paxt. They restricted the name *Sarcochilus* to two Sikkim species, *S. luniferus* Benth. and *S. pygmaeus* King & Pantl. Of the former they stated that it was exactly similar in essential structure to Australian *Sarcochilus*, but in this they were wrong. *S. luniferus* was transferred to *Chiloschista* by Smith; the latter genus was also later recognized by Schlechter as distinct from *Sarcochilus*. But *S. pygmaeus* appears to me to belong to *Thrixspermum* sect. *Dendrocolla* (to which it is transferred in a later part of the present paper). So far as I know, the genus *Sarcochilus*, as restricted to near allies of the original species, is confined to Australia.

Unfortunately the generic name *Ornitharium* was not the first given to a species of *Dendrocolla* sect. *Tubera* Bl.; the name *Pteroceras* Hassk. was earlier. But before describing the essential characters of this genus, a discussion on morphological characters which may serve for generic distinctions among the Sarcanthine orchids is desirable.

Almost all authors, from Lindley to Schlechter, have ranked the presence or absence of a column-foot as a character of major importance; Schlechter used this distinction on which to establish the first main division of the Sarcanthine genera. But some of the genera which Schlechter placed in his

footless group (e.g., *Vanda*) have a foot quite distinctly developed, as can be seen in a longitudinal section of a flower. Though there are certainly genera in which a long or a short foot is a universal character, there are others in which the length is variable, among them being Malaysian 'Sarcochilus'; and very few orchids in the whole group can be said to lack a foot entirely.

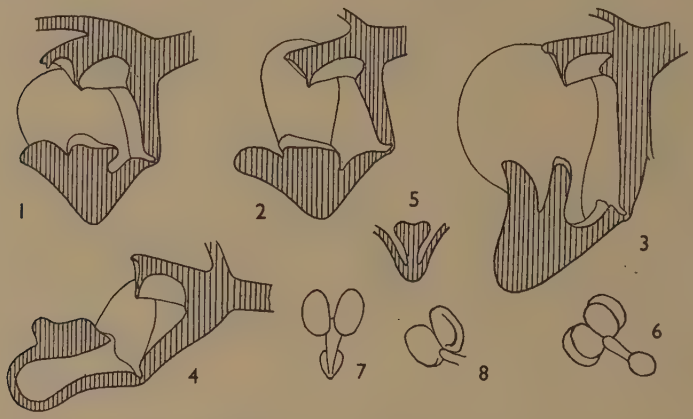

FIG. 1. Median longitudinal sections through lip and column, 1, *Sarcochilus hartmannii*, × 5; 2, *fitzgeraldii*, × 5; 3, *S. falcatus*, × 5; 4, *Pteroceras pallidum*, × 2¼. 5, *Sarcochilus fitzgeraldii*, transverse section through sac of lip, showing attachment of callus. 6, *S. hartmannii*, pollinia, seen from below. 7, *Pteroceras pallidum*, pollinia, seen from above. 8, as fig. 7, oblique view to show clefts in pollinia.

Another character used by many taxonomists for basic division of this group of genera is the presence or absence of a spur. Again, this is a variable character, and it is impossible to distinguish sharply between spurred and saccate lips. In the genus *Trichoglottis* the development of the spur is very variable (also of the column-foot), but other floral characters are uniform and distinctive. In the Malaysian genus which has been called *Sarcochilus* there is much variation in the development of the spur, as also of the column-foot (in *S. ciliatus* (Ridl.) J.J.Sm. both column-foot and spur are almost lacking).

It seems to me preferable to follow the practice of Smith and to accord greater significance to the following kinds of character: number and form of pollinia, form of stipes and disc; shape and structure of the lip, especially the presence and position of calli or septa, and the character of a hinged lip as distinct from one immovably joined to the column (and thus not sharply distinct from the column-foot).

As regards pollinia, in the Sarcanthine orchids there appear (at a casual glance) always to be two, except in *Taeniophyllum* and a few other genera in which there are clearly four equal pollinia. But in some cases each unit of a pair actually consists of two separate pollinia, in other cases it is a single pollinium with a more or less extensive cleft in the back, and in a few cases the cleft is quite lacking. Smith was very careful in his observations of such matters; and as the Australian and Malaysian species referred to *Sarcochilus* differ consistently in their pollinia, I think he cannot have seen flowers of an

Australian species. True *Sarcochilus* of Australia agree with *Thrixspermum* in having four pollinia, in two pairs; the Malaysian species have two pollinia deeply notched. *Chroniochilus* J.J.Sm. and *Saccolabium* Bl. (in the restricted sense accepted by Smith, not in the broad sense of Hooker and Ridley) have a pair of entire pollinia. Schlechter thought that characters of this kind were not a satisfactory basis for major sub-division of the Sarcanthine genera (Die Orchideen 555: 1914), but Smith has used them for this purpose in his key to the genera of orchids in Malaysia (Blumea **1**, 194–215: 1934) and the result appears to me very satisfactory. It should however be noted that in the key in question the following errors occur: *Gastrochilus* Don has two pollinia (not 4, as in the key), and Ridley's genera *Renantherella* and *Pelatantheria* both have four pollinia (not 2, as in the key).

Sarcochilus R.Br. has the following characters: pollinia 4, in two pairs (members of a pair unequal) on a stipes which is not greatly elongate; column-foot long, in part joined to the lateral sepals, the end free, the lip distinctly jointed to it; lip rather shallowly saccate, the sac almost filled by a callus which is attached along the mid-line of the sac and may be longitudinally furrowed on its upper surface; side-lobes well developed, more or less erect, midlobe small and fleshy, not of complex structure; flowers lasting several days. Sections of the column and lip of three species (drawn from fresh flowers) are shown in fig. 1/1–3, 5, 6, and also pollinia of one species.

Sarcochilus sensu J.J.Sm. is characterised as follows: pollinia 2, each of them somewhat cleft, stipes more or less elongate; column-foot present but variable in length, the lip distinctly jointed to it; lip usually consisting of a spur pointing forwards in line with the column-foot, with no calli inside the spur; side-lobes always present, of variable form and sometimes fleshy; midlobe small and fleshy, usually of complex shape, fused to the outer surface of the spur remote from the column-foot; flowers usually lasting one day. The two characters in which there is absolute distinction from true *Sarcochilus*, in all species known to me, are the form of the pollinia and the absence of calli in the spur or sac of the lip. A section of the flower of *Sarcochilus pallidus* (Bl.) Rchb.f., and drawings of pollinia, are shown in fig. 1/4, 7, 8.

The characters above noted for *Sarcochilus* sensu J. J. Smith are those of *Dendrocolla* sect. *Tubera* Bl. (apart from the species *D. spuria* which is a *Dendrobium*, and *D. minima*, which, as noted below, has been transferred to *Chroniochilus*). As Blume's other two sections belong to *Thrixspermum*, it might seem reasonable to regard the remaining section *Tubera* as true *Dendrocolla*, and so to use the name *Dendrocolla* for *Sarcochilus* sensu J. J. Smith. But unfortunately Ridley, regarding Blume's third section as a distinct genus, used for that section alone the name *Dendrocolla*, thus in effect typifying the genus by a species of section 3; and when Smith transferred section 3 to *Thrixspermum*, he called it sect. *Dendrocolla*. Therefore it seems to me that one cannot now revive the name *Dendrocolla* for a genus founded on section 2.

The next generic name proposed for a species of section 2 was *Pteroceras* Hassk. (Flora **25**, band 2, Beibl. 6: 1852). Hasskarl based his genus (possibly also the generic name) and the species *Pteroceras radicans*, on notes and drawings made by van Hasselt from living plants; these notes and

drawings are now preserved at Bogor. Specimens of the plants from which the drawings and notes were made were sent (after the untimely death of van Hasselt) to Blume, and are now preserved in the Rijksherbarium at Leiden; they are certainly referable to *Dendrocolla teres* Bl., and were probably part of the original material on which that species was based, though Hasskarl makes no mention of Blume's species (or of any other). It is clear that Hasskarl's specific epithet *radicans* was nomenclaturally superfluous when published and therefore is to be disregarded; but his generic name is not superfluous, and it appears to be the correct name for Malaysian '*Sarcochilus*'. The name *Ornitharium* was published later by Lindley & Paxton for an Indian plant which Smith considered to belong to *D. teres* Bl., though Hooker considered the Indian and Javan plants distinct (see references below; Smith in 1905 used the name *suaveolens* for this species, though *teres* is older, but later changed his practice, as shown in Fedde, Rep. **32**, 359: 1933).

Ridley separated a genus *Ascochilus*, but the only clear character separating it from typical species of *Pteroceras* is the rough surface of the scape. The species of *Ascochilus* also are all rather small vegetatively, and most of them have inflorescences in clusters in the leaf-axils; but the latter character is not confined to species with rough scapes, and there is a considerable range in size of flowers in typical species of *Pteroceras*. The character of tufted inflorescences occurs also in other genera (e.g., *Trichoglottis*, *Adenoncos*); probably there is really one inflorescence which branches so near the base that the branching is not evident.

The variability in the spur in *Pteroceras* has been mentioned above. Carr also commented on this (Gard. Bull. S.S. **5**, 24: 1929), but he included the species separated by Smith as *Chroniochilus*, a separation maintained below.

The following species of *Pteroceras*, as here construed, have flowers lasting several days: *P. berkeleyi*, *P. alatum*, *P. hirsutum*. Of these, the first two (and probably also the third, of which I have not seen good material) have an unusually long rostellum, and thus long stipes for the pollinia, and also have the direction of the spur of the lip not continuing the line of the column-foot. *P. alatum* has the peculiar character of developing the full length of the inflorescence before the flowers begin to grow; I have not seen living plants of the others. The elongate inflorescence is quite comparable with that of *P. teres*, the type species of *Pteroceras*.

There is thus no doubt that the genus *Pteroceras*, as here restricted, has a considerable range of form, and it may be that distinct sections should be recognized; but I think it is a natural genus, and I have no doubt whatever that it is very distinct from *Sarcochilus* R.Br. The following list of species transferred to *Pteroceras* is not complete. I have restricted it to those from the Malay Peninsula which I have myself examined, those in the original edition of J. J. Smith's 'Orchideen von Java', one from NE. India and one from Ceylon.

Pteroceras *Hassk.* in Flora **25**, Band 2, Beibl. 6 (1842)

Dendrocolla sect. *Tubera* Bl., Bijdr. 286 (1825)
Ornitharium Lindl. & Paxt., Fl. Gard. **1**, 188, fig. 117 (1850–51)
[*Thrixspermum* sensu Rchb. f., Xen. Orch. **2**, 121 (1867), *pro parte*, non Lour.]

Sarcochilus sect. *Tubera* Benth. in Benth. & Hook. f., Gen. Plant. **3**, 575 (1883), *pro parte*
Ascochilus Ridl. in Journ. Linn. Soc. Bot. **32**, 374 (1895)
[*Sarcochilus* sensu J.J.Sm., Fl. Buit. **6**, 555(1905); Ridl., Fl. Mal. Penin. **4**, 177 (1924); Holtt., Rev. Fl. Mal. **1**, 676 (1953); non R. Br.]

TYPE SPECIES: *Pteroceras radicans* Hassk., *l.c.* (= *Dendrocolla teres* Bl.)

LIST OF SPECIES TRANSFERRED TO *PTEROCERAS*, IN ALPHABETICAL ORDER

Pteroceras alatum (*Holtt.*) *Holtt.*, comb. nov.

Sarcochilus alatus Holtt. in Gard. Bull. Singap. **14**, 5 (1953); Rev. Fl. Mal., ed. 2, **1**, 684, fig. 208a (1957)

Pteroceras appendiculatum (*Bl.*) *Holtt.*, comb. nov.

Dendrocolla appendiculata Bl., Bijdr. 289 (1825)
Grosourdya appendiculata (Bl.) Rchb. f., Xen. Orch. **2**, 123 (1867)
Thrixspermum appendiculatum (Bl.) Kuntze, Rev. Gen. Pl. **2**, 682 (1891)
Sarcochilus hirtulus Hook. f., Fl. Brit. Ind. **6**, 89 (1890), & Ic. Pl. **22**, t. 2121 (1892)
Ascochilus hirtulus (Hook. f.) Ridl. in Journ. Linn. Soc. Bot. **32**, 375 (1896); Fl. Mal. Penin. **4**, 181 (1924)
Sarcochilus appendiculatus (Bl.) J.J.Sm., Fl. Buit. **6**, 564, fig. 425 (1905); Holtt., Rev. Fl. Mal. **1**, 685 (1953)

Pteroceras berkeleyi (*Rchb. f.*) *Holtt.*, comb. nov.

Thrixspermum berkeleyi Rchb. f. in Gard. Chron., ser. 2, **17**, 557 (1882)
Sarcochilus berkeleyi (Rchb. f.) Hook. f., Fl. Brit. Ind. **6**, 37 (1890); Ann. R. Bot. Gard. Calc. **5**, 44, t. 66 (1895); Holtt., Rev. Fl. Mal. **1**, 679 (1953)

Pteroceras biserratum (*Ridl.*) *Holtt.*, comb. nov.

Sarcochilus biserratus Ridl. in Journ. Bot. **38**, 73 (1900); Holtt., Rev. Fl. Mal. **1**, 681 (1953).

J. J. Smith placed this as a synonym of *Sarcochilus compressus* (Bl.) Rchb. f. (Fl. Buit. **6**, 556), mis-spelling the name *biseriatus*. Though very near Blume's species, *P. biserratum* differs in more slender inflorescences with smaller, less regularly two-ranked bracts, and smaller flowers.

Pteroceras caligare (*Ridl.*) *Holtt.*, comb. nov.

Sarcochilus caligaris Ridl. in Trans. Linn. Soc. Bot. **3**, 372 (1893); Holtt., Rev. Fl. Mal. **1**, 680 (1953)

Pteroceras carrii (*L. O. Will.*) *Holtt.*, comb. nov.

S. maculatus Carr in Gard. Bull. S.S. **5**, 26, t. 12A (1929), non Benth. ex Pfitz., Vergl. Morph. Orch. 15 (1882)
Sarcochilus carrii L. O. Will. in Bot. Mus. Leafl. Harv. Univ. **5**, 57 (1937)

Pteroceras ciliatum (*Ridl.*) *Holtt.*, comb. nov.

Dendrocolla ciliata Ridl. in Journ. Str. Br. R. Asiat. Soc. **44**, 192 (1905)

Thrixspermum blepharolobum Schltr. in Orchis **5**, 53 (1911)
Sarcochilus ciliatus (Ridl.) J.J.Sm. in Bull. Jard. Bot. Buit., sér. 3, **8**, 63 (1926); Holtt., Rev. Fl. Mal. **1**, 684 (1953)

Pteroceras compressum (*Bl.*) *Holtt.*, comb. nov.

Dendrocolla compressa Bl., Bijdr. 289 (1825)
Sarcochilus compressus (Bl.) Rchb. f. in Walp., Ann. **6**, 498 (1863); J.J.Sm., Fl. Buit. **6**, 556, fig. 420 (1905)

Pteroceras ecalcaratum (*Holtt.*) *Holtt.*, comb. nov.

Sarcochilus ecalcaratus Holtt., Rev. Fl. Mal. **1**, 684 (1953)
[*Sarcochilus siamensis* sensu Carr in Gard. Bull. S.S. **5**, 31, *pro parte*, quoad t. 11B (1929), non (Ridl.) Carr]
S. carrii Holtt. in Gard. Bull. Singap. **11**, 288 (1947), non L. O. Will. (1937)

Pteroceras emarginatum (*Bl.*) *Holtt.*, comb. nov.

Dendrocolla emarginata Bl., Bijdr. 290 (1825)
Sarcochilus emarginatus (Bl.) Rchb. f. in Walp., Ann. **6**, 500 (1863); J.J.Sm., Fl. Buit. **6**, 561, fig. 423 (1905)
Grosourdya emarginata (Bl.) Rchb. f., Xen. Orch. **2**, 123 (1867)
Thrixspermum emarginatum (Bl.) Kuntze, Rev. Gen. Pl. **2**, 682 (1891)

Pteroceras fasciculatum (*Carr*) *Holtt.*, comb. nov.

Sarcochilus fasciculatus Carr in Gard. Bull. S.S. **5**, 28, t. 14A (1929); Holtt., Rev. Fl. Mal. **1**, 684 (1953)

Pteroceras hirsutum (*Hook. f.*) *Holtt.*, comb. nov.

Sarcochilus hirsutus Hook. f., Fl. Brit. Ind. **6**, 38 (1890); Holtt., Rev. Fl. Mal. **1**, 685 (1953)
Sarcochilus burchardianus Schltr. in Bull. Herb. Boiss., sér. 2, **6**, 467 (1906); J. J. Sm. in Bull. Jard. Bot. Buit., sér. 3, suppl. **3**, t. 116I (1938)
Ascochilus hirsutus (Hook. f.) Ridl., Mat. Fl. Mal. Penin. **1**, 179 (1907); Burkill in Gard. Bull. S.S. **3**, 15, 16, with fig. (1923)

Pteroceras johorense (*Holtt.*) *Holtt.*, comb. nov.

Sarcochilus johorensis Holtt. in Gard. Bull. Singap. **11**, 289 (1947)

Pteroceras minutiflorum (*Ridl.*) *Holtt.*, comb. nov.

Ascochilus minutiflorum Ridl. in Journ. Str. Br. R. Asiat. Soc. **39**, 85 (1903)
Sarcochilus minutiflorus (Ridl.) Holtt. in Gard. Bull. Singap. **11**, 289 (1947); Rev. Fl. Mal. **1**, 685 (1953)

Pteroceras pallidum (*Bl.*) *Holtt.*, comb. nov.

Dendrocolla pallida Bl., Bijdr. 290 (1825)
Sarcochilus unguiculatus Lindl., Bot. Reg. **26**, Misc. 67 (1840) & **32**, sub t. 109 (1846); Ridl., Fl. Mal. Penin. **4**, 178 (1924)
Aërides pallidum (Bl.) Lindl., Gen. & Sp. Orch. 241, (1833), non *Aërides pallidum* Bl., Rumphia **4**, 53 (1848)

Sarcochilus pallidus (Bl.) Rchb. f. in Walp., Ann. **6**, 500 (1863); J.J.Sm., Fl. Buit. **6**, 559, fig. 422 (1905); Holtt., Rev. Fl. Mal. **1**, 680, fig. 209 (1953)
Thrixspermum pallidum (Bl.) Rchb. f., Xen. Orch. **2**, 122 (1867)
Sarcochilus aureus Hook. f., Fl. Brit. Ind. **6**, 35 (1890) & in Ann. R. Bot. Gard. Calc. **5**, 42, t. 64 (1895)
Sarcochilus cladostachys Hook. f., Fl. Brit. Ind. **6**, 35 (1890); Ann. R. Bot. Gard. Calc. **5**, 43, t. 65 (1895); Ridl., Fl. Mal. Penin. **4**, 179 (1924)

Pteroceras siamense (*Ridl.*) *Holtt.*, comb. nov.

Ascochilus siamensis Ridl. in Journ. Linn. Soc. Bot. **32**, 375 (1896)
Sarcochilus siamensis (Ridl.) Carr in Gard. Bull. S.S. **5**, 31 (1929), *nomen tantum*; Holtt., Rev. Fl. Mal. **1**, 683 (1953)
S. mentakabensis Carr, *l.c.* 29, t. 12B (1929)

Pteroceras stenoglottis (*Hook. f.*) *Holtt.*, comb. nov.

Sarcochilus stenoglottis Hook. f., Fl. Brit. Ind. **6**, 34 (1890) & in Ann. R. Bot. Gard. Calc. **5**, 41, t. 62 (1895); Holtt., Rev. Fl. Mal. **1**, 687, fig. 208 (1953)

The column-foot in this species is very short, but the base of the lip is quite distinct from it ; the spur is bent at almost a right-angle in the middle.

Pteroceras suaveolens (*Roxb.*) *Holtt.*, comb. nov.

Aërides suaveolens Roxb., Fl. Ind. **3**, 473 (1832), non Bl., Rumphia **4**, 53 (1848)
Sarcochilus suaveolens (Roxb.) Hook. f., Fl. Brit. Ind. **6**, 33 (1890)
Ornitharium striatulum Lindl. & Paxt., Fl. Gard. **1**, 188, fig. 117 (1850–51); King & Pantling in Ann. R. Bot. Gard. Calc. **8**, 243, t. 323 (1898)

Pteroceras tanyphyllum (*Ridl.*) *Holtt.*, comb. nov.

Sarcochilus tanyphyllus Ridl. in Trans. Linn. Soc. Bot. **3**, 372 (1893); Holtt., Rev. Fl. Mal. **1**, 680 (1953)

Pteroceras teres (*Bl.*) *Holtt.*, comb. nov.

Dendrocolla teres Bl., Bijdr. 289 (1825)
Aërides teres (Bl.) Lindl., Gen. & Sp. Orch. 240 (1833); Miq., Fl. Ind. Bat. **3**, 697 (1859)
Pteroceras radicans Hassk. in Flora **25**, Band 2, Beibl. 6 (1842); Tijdschr. Nat. Geschied. & Phys. **9**, 142 (1842); Cat. Hort. Bog. 43 (1844)
Pteroceras sp. De Vriese, Ill. Orch. t. 9, fig. 5 (1854)
Sarcochilus teres (Bl.) Rchb. f. in Walp., Ann. **6**, 499 (1863); J.J.Sm. in Fedde, Rep. **32**, 359 (1933)
Thrixspermum teres (Bl.) Rchb. f., Xen. Orch. **2**, 121, 123, t. 140 (1867)
Sarcochilus vriesii Ridl. in Journ. Linn. Soc. Bot. **30**, 297 (1891)
[*S. suaveolens* sensu J. J. Sm., Fl. Buit. **6**, 560 (1905), *pro parte*, non Hook. f.]

Pteroceras teysmannii (*Miq.*) *Holtt.*, comb. nov.

Aërides teysmannii Miq., Choix des Pl. t. 18 (1863)

Thrixspermum teysmannii (Miq.) Rchb. f., Xen. Orch. **2**, 121 (1867)
Sarcochilus teysmannii (Miq.) J.J.Sm., Fl. Buit. **6**, 557, fig. 421 (1905)

Pteroceras violaceum (*Ridl.*) *Holtt.*, comb. nov.

Sarcochilus violaceus Ridl. in Journ. Fed. Mal. Str. Mus. **6**, 183 (1915); Holtt., Rev. Fl. Mal. **1**, 681 (1953)

Pteroceras viridiflorum (*Thw.*) *Holtt.*, comb. nov.

Aërides viridiflora Thw., Enum. Pl. Zeyl. 430 (1864)
Sarcochilus viridiflorus (Thw.) Hook. f., Fl. Brit. Ind. **6**, 38 (1890)

Pteroceras zollingeri (*Rchb. f.*) *Holtt.*, comb. nov.

Dendrocolla zollingeri Rchb. f., Xen. Orch. **1**, 213, t. 86, fig. 1 (1856)
Sarcochilus zollingeri (Rchb. f.) Rchb. f. in Walp., Ann. **6**, 500 (1863); J.J.Sm., Fl. Buit. **6**, 563, fig. 424 (1905)
Grosourdya zollingeri (Rchb. f.) Rchb. f., Xen. Orch. **2**, 123 (1867)

Other genera which have been united to *Thrixspermum* or *Sarcochilus*

Chamaeanthus Schltr. in J. J. Sm., Fl. Buit. **6**, 552 (1905)

Type species: *C. brachystachys* Schltr., *l.c.*, fig. 418.

Smith commented that this genus differs from *Sarcochilus* (i.e., *Pteroceras*) only in its unspurred labellum. But the spur is very variable in the smaller-flowered species of *Pteroceras*, and in some there is no spur (*P. ciliatum* and *P. ecalcaratum*); and in *Chamaeanthus laciniatus* Carr the lip is distinctly saccate at the base. If *Chamaeanthus* is to be kept distinct from *Pteroceras*, the distinctive characters appear to be the very short scape of the inflorescence, the not-diverging sepals and petals, and the distinct elongate midlobe. I think that probably *Chamaeanthus* would better rank as a section of *Pteroceras*.

Cheirorchis Carr in Gard. Bull. S.S. **7**, 40 (1932)

Type species: *C. breviscapa* Carr, *l.c.* 41, t. 3 (1932); Holtt., Rev. Fl. Mal. **1**, 674 (1953)

This genus is very near *Chamaeanthus* and *Pteroceras*, agreeing in pollinia and hinged lip. There is however a papillose callus in the sac of the lip and the well-developed midlobe is also usually papillose. The vegetative habit is also apparently distinctive. No further species have been added to the genus since the original publication of Carr (five species in all). The author did not designate a type species; I have selected one which he figured. Of the five species, three were new, the two others being based on: *Sarcochilus filiformis* Hook. f., Fl. Brit. Ind. **6**, 39 (1890), & Ic. Pl. **22**, t. 2124 (1892), and *Dendrocolla fulgens* Ridl. in Journ. Linn. Soc. Bot. **32**, 383 (1896). Ridley included both of these species in *Dendrocolla* (*Thrixspermum* sect. *Dendrocolla* J. J. Sm.) but he was certainly wrong in so doing; the pollinia are two, each one more or less cleft.

Chiloschista *Lindl.*, Bot. Reg. **18**, sub t. 1522 (1832)

TYPE SPECIES: *C. usneoïdes* (Don) Lindl., *l.c.*; Wight, Ic. Pl. Ind. Or. **5**, t. 1741 (1851); Schltr. in Fedde, Rep., Beih. **4**, 275 (1919)

Epidendrum usneoïdes Don, Prodr. Fl. Nep. 37 (1825)
Sarcochilus usneoïdes Rchb. f. in Walp., Ann. **6**, 497 (1863); Hook. f., Fl. Brit. Ind. **6**, 37 (1890)

This appears to me a distinct genus, which includes also the following two species.

Chiloschista lunifera (*Rchb. f.*) *J. J. Sm.*, Fl. Buit. **6**, 553 (1905), *nomen tantum*

Thrixspermum luniferum Rchb. f. in Gard. Chron. **1868**, 786 (1868)
Sarcochilus luniferus (Rchb. f.) Benth. ex Hook. f. in Bot. Mag. **115**, t. 7044 (1889); Hook. f., Fl. Brit. Ind. **6**, 37 (1890); King & Pantl. in Ann. R. Bot. Gard. Calc. **8**, 207, t. 276 (1898)

Chiloschista javanica *Schltr.* in Fedde, Rep., Beih. **4**, 275 (1919)

[*C. lunifera* sensu J. J. Sm., Fl. Buit. **6**, 553, (excl. syn.), fig. 419 (1905), non *Thrixspermum luniferum* Rchb. f.]

Chroniochilus *J. J. Sm.* in Bull. Jard. Bot. Buit., sér. 2, **26**, 81 (1918)

TYPE SPECIES: *C. tjidadapensis* J. J. Sm., *l.c.* (= *C. minimus* (Bl.) J. J. Sm.)

This genus is distinguished as follows: flowers two-ranked, lasting one or several days; column-foot long, with free end, jointed to the lip; lip saccate with a callus in it of different substance from the rest of the lip, midlobe very fleshy; pollinia quite entire or with a very small notch. In addition to the following species, it is possible that *Sarcochilus tahanensis* Ridl. also belongs to the genus (Holttum, Rev. Fl. Mal. **1**, 682: 1953).

Chroniochilus minimus (*Bl.*) *J. J. Sm.* in Bull. Jard. Bot. Buit., sér. 3, **8**, 366 (1927)

Dendrocolla minima Bl., Bijdr. 290 (1825)
Chroniochilus tjidadapensis J. J. Sm. in Bull. Jard. Bot. Buit, sér. 3, **6**, t. 12 (1924) & *l.c.* **8**, 366 (1927)
Sarcochilus tjidadapensis (J.J.Sm.) Carr in Gard. Bull. S.S. **5**, 24 (1929) & **7**, 40 (1932); Holtt., Rev. Fl. Mal. **1**, 683 (1953)
Sarcochilus tembelingensis Carr in Gard. Bull. S.S. **5**, 25, t. 11A (1929)

Chroniochilus virescens (*Ridl.*) *Holtt.*, comb. nov.

Sarcochilus virescens Ridl. in Journ. Str. Br. R. Asiat. Soc. **39**, 85 (1903); Carr in Gard. Bull. S.S. **5**, 23, t. 10 (1929); Holtt., Rev. Fl. Mal. **1**, 682, fig. 210 (1953)

Cylindrochilus *Thw.*, Enum. Pl. Zeyl. 307 (1861)

TYPE SPECIES: *C. pulchellus* Thw., *l.c.*

This species undoubtedly belongs to *Thrixspermum* sect. *Dendrocolla*, and was so placed by Schlechter (Orchis **5**, 57: 1911). Other names:—

Dendrocolla pulchella Thw., Enum. Pl. Zeyl. 430 (1864)

Sarcochilus pulchellus (Thw.) Trim., Syst. Cat. Ceyl. Pl. 89 (1885); Hook. f., Fl. Brit. Ind. **6**, 39 (1890)

Grosourdya *Rchb. f.* in Bot. Zeit. **1864**, 297 (1864)

Type species: *C. elegans* Rchb. f., *l.c.*; described from a cultivated plant of uncertain origin, thought to have come from Malaysia.

The description is such that I am uncertain to which genus this species belongs. J. J. Smith apparently did not see the type when he studied specimens from Reichenbach's herbarium. Of species subsequently placed in this genus by its author, *G. appendiculata* (Bl.) Rchb. f., *G. emarginata* (Bl.) Rchb. f. and *G. zollingeri* (Bl.) Rchb. f. are above referred to *Pteroceras*; but *G. hystrix* (Bl.) Rchb. f. belongs to *Thrixspermum* sect. *Dendrocolla*.

Gunnia *Lindl.*, Bot. Reg. **20**, sub t. 1699 (1834)

Type species: *G. australis* Lindl., *l.c.*

This species was transferred to *Sarcochilus* by Reichenbach (Walp.; Ann. **6**, 501: 1863), and is now generally regarded by Australian botanists as belonging to that genus; in my opinion, this disposition is correct.

Micropera *Lindl.*, Bot. Reg. **18**, sub t. 1522 (1832)

Type species: *M. pallida* (Roxb.) Lindl., *l.c.*

Lindley later realized that this species belonged to his own genus *Camarotis*. The synonymy is as follows (Hooker had to give a new name in *Sarcochilus* because *Dendrocolla pallida* Bl. had already been transferred to that genus):—

Aërides pallidum Roxb., Fl. Ind. **3**, 475 (1832)
Camarotis pallida Lindl. in Journ. Linn. Soc. Bot. **3**, 37 (1859); J. J. Sm., Nat. Tijdschr. Ned. Ind. **72**, 98 (1912)
Sarcochilus roxburghii Hook. f., Fl. Brit. Ind. **6**, 36 (1890)

In 1851, Dalzell described two new species of *Micropera*, *M. maculata* and *M. viridiflora* (in W. J. Hook., Kew Journ. Bot. **3**, 282: 1851). When Lindley transferred *M. pallida* to *Camarotis*, he stated that *M. maculata* Dalz. was something quite different, not referable to any known genus; he therefore suggested that the name *Micropera* should be retained for Dalzell's species, and the name *Micropera* Dalz. was mentioned by some subsequent authors, but by the present 'International Code' such a name has no status. Bentham transferred *M. maculata* to *Sarcochilus* (Gen. Plant. **3**, 575: 1883) and J. D. Hooker to *Saccolabium* (Fl. Brit. Ind. **6**, 64: 1890). There is a specimen of *M. maculata* from Dalzell, in the Lindley Herbarium at Kew, with a careful drawing of a flower by Lindley. This drawing shows that the sac of the lip was hairy within, but shows no section of the flower. I would like to see fresh flowers of this species before assigning it to a genus.

Dalzell's second species, *M. viridiflora*, was transferred to *Saccolabium* by Lindley (*l.c.*) and to *Sarcochilus* by Cooke (Fl. Bomb. **2**, 697: 1907); but as the name *Sarcochilus viridiflorus* (Thw.) Hook. f. (here transferred to *Pteroceras*) has priority, Santapau proposed a new specific epithet in *Sarcochilus*, *S. dalzellianus* (Kew Bull. **3**, 498: 1948). In recent work (unpublished) on the orchids of Bombay, H. Santapau & Z. Kapadia recognize that *M. viridiflora* Dalz. is distinct from *Sarcochilus*, and propose to transfer it to *Gastrochilus*

D. Don. I have examined their material, for the loan of which I am grateful, and believe they are right in this judgement, though the lip of this species has a rather narrow spur in place of the wide sac of Malaysian species of *Gastrochilus*.

Orsidice *Rchb. f.* in Bonplandia **2**, 93 (1854)

TYPE SPECIES: *O. amplexicaulis* (Bl.) Rchb. f., *l.c.*

This species, based on *Dendrocolla amplexicaulis* Bl., certainly belongs to the genus *Thrixspermum*, to which it was later transferred by Reichenbach himself (Xen. Orch. **2**, 121: 1867). Smith used the name *Orsidice* as a sectional name in *Thrixspermum*, but this is the section which includes the type species of the genus, so that it ought to be called sect. *Thrixspermum*, not sect. *Orsidice*. The only other species included in the genus by Reichenbach was *O. lilacina*, based on *Sarcochilus lilacinus* Griff., which is a synonym of *T. amplexicaule*.

Ridleya (*Hook. f.*) *Pfitz.* in Engl., Pflanzenfam., Nachtr. II, 16 (1900).

Sarcochilus sect. *Ridleya* Hook. f., Fl. Brit. Ind. **6**, 42 (1890)

TYPE SPECIES: *Sarcochilus notabilis* Hook. f., *l.c.*

The sole species of this genus, *R. notabilis*, is certainly referable to *Thrixspermum*; the transfer was made by Ridley in Journ. Linn. Soc. Bot. **32**, 379 (1896). Smith subsequently identified this species with the earlier *Dendrocolla acuminatissima* Bl. (Bijdr. 288: 1825); this name was transferred to *Thrixspermum* by Reichenbach (Xen. Orch. **2**, 121).

Stereochilus *Lindl.* in, Journ. Linn. Soc. Bot. **3**, 38 (1859).

TYPE SPECIES: *S. hirtus* Lindl., *l.c.*

Bentham transferred this species to *Sarcochilus* (Gen. Plant. **3**, 576: 1883), and J. D. Hooker also so placed it (Fl. Brit. Ind. **6**, 35), but King & Pantling maintained its original status (Ann. R. Bot. Gard. Calc. **8**, 237, t. 315). J. J. Smith, in reviewing the genus *Sarcanthus*, included *S. hirtus* in his list of species of that genus, but he wrongly attributed the combination *Sarcanthus hirtus* to J. D. Hooker, so that this name has not yet appeared in the 'Index Kewensis'; it should be **Sarcanthus hirtus** (*Lindl.*) *J. J. Sm.* in Natuurk. Tijdschr. Ned. Ind. **72**, 87 (1912). I agree with Smith in this disposition of the species.

King & Pantling also placed in the genus *Stereochilus* a species of Hooker's, *Cleisostoma bicuspidatum*. This was transferred to *Sarcanthus* by Smith (*l.c.*), and certainly belongs to *Sarcanthus* as I understand that genus. In another work King & Pantling described a further species *Stereochilus wattii* (Journ. Asiat. Soc. Beng. **66**, 595: 1897), from Assam. I have not seen a specimen, and am not sure from the description whether this is also a *Sarcanthus*.

TWO SPECIES WHICH ARE NEITHER *SARCOCHILUS* NOR *PTEROCERAS*

Sarcochilus pygmaeus King & Pantl. in Ann. R. Bot. Gard. Calc. **8**, 207, pl. 277, (1898). This species is in my opinion referable to *Thrixspermum* sect. *Dendrocolla*, and should be called **Thrixspermum pygmaeum** (*King & Pantl.*) *Holtt.*, comb. nov.

Sarcochilus solomonensis Rolfe in Kew Bull. **1908**, 72 (1908); Bot. Mag. **143**, t. 8737 (1917). I do not think that this is a true *Sarcochilus*; it is certainly not *Pteroceras*. Rolfe stated that there is a crest on the disc of the lip, but did not describe its shape or position exactly, and he gave no longitudinal section of the flower. Schlechter (Fedde Rep., Beih. **1**, 967: 1914) stated that an earlier name is *Thrixspermum moorei* Rchb. f. (1880), and made the new combination *Sarcochilus moorei*, citing several synonyms, but he gave no further details of structure.

A new combination in Convolvulaceae.—The usual name for the widespread West African Convolvulaceous plant, *Bonamia cymosa* (Roem. & Schult.) Hallier f. is based on an illegitimate name, *Convolvulus cymosus* Roem. & Schult., which has two earlier homonyms. Roemer and Schultes, however, had discovered their mistake in using the epithet '*cymosus*'* and gave in their 'Corrigenda' (pp. 879–888) of the same volume in which they had published this illegitimate name a new one, *Convolvulus thunbergianus*, on p. 884. This has been apparently overlooked by botanists ever since, and is not even listed in the 'Index Kewensis', but it should be mentioned here that the copy of vol. 4 of Roemer and Schulte's 'Systema Vegetabilium' in the Kew Library was carefully annoted with pencil remarks, written by N. E. Brown, referring to these 'Corrigenda'. These pencil notes led the present writer to locate the correct name for this plant.

Bonamia thunbergiana (*Roem. & Schult.*) *Heine*, comb. nov.

Convolvulus cymosus Roem. & Schult., *l.c.* 303 (1819), non Desr. in Lam., Encycl. **3**, 556 (1791) [ind. or.], nec Ruiz & Pavon, Fl. Peruv. **2**, 9, t. 117 (1799) [am. austr.], *nom. illegit.*
C. thunbergianus Roem. & Schult., Syst. Veg. **4**, 884 (1819)
C. senegambiae Spreng., Syst. **1**, 610 (1825)
Ipomoea secunda G. Don, Gen. Syst. **4**, 282 (1838); Choisy in DC., Prodr. **9**, 390 (1845)
Ipomoea senegambiae (Spr.) Choisy in DC., Prodr. **9**, 351 (1845)
Ipomoea afzelii Choisy, *l.c.* 373 (1845)
Brewería secunda (G. Don) Benth. in Hook., Nig. Fl. 470 (1849)
Bonamia cymosa (Roem. & Schult.) Hall.f. in Engl., Bot. Jahrb. **18**, 91 (1893); Bak. & Rendle in Fl. Trop. Afr. **4**(2), 79 (1905); A. Chev., Explor. Bot. Afr. Occ. Fr. **1**, 459 (1920); Hutch. & Dalz., Fl. W. Trop. Afr., ed. 1, **2**, 210 (1931), *nom. illegit.*

H. HEINE

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* They gave the following note under the newly described *Convolvulus cymosus*: 'CONV. *cymosus Lam. Enc.* III. *p.* 533 est planta longe diversa, uti etiam C. *cymosus* peruvianus. *Fl. Peruv.* II. *p.* 9. *Tab.* 117. *fig.* b.'

Contributions to the Flora of Australia: VI

R. Melville

THE POLLINATION MECHANISM OF ISOTOMA AXILLARIS LINDL. AND THE GENERIC STATUS OF ISOTOMA LINDL.

While idly admiring the beauty of the flowers of *Isotoma axillaris* Lindl. in the greenhouse, the purposeful appearance of the curved bristle-like hairs attached to the end of the anther-tube caught my attention. Wondering whether they played some part in a pollination mechanism, I took a pencil and touched the hairs. Immediately a small mass of pollen was extruded from the end of the pollen-tube. Each time the hairs were gently depressed, a further quantum of pollen was extruded (Fig. 1A). As the hairs were strategically placed to contact any insect alighting on the open corolla, there appeared to be a very neat method for dispensing an appropriate amount of pollen for each visitor and preventing its wasteful dispersal. From the external appearance of the anther-tube, it was not evident how the mechanism worked. Flowers were therefore collected and examined under a binocular microscope.

The examination revealed a piston mechanism similar to that of other members of the *Lobeliaceae*. The pollen is shed into the anther-tube when, or just before, the flower opens. The flowers are strongly protandrous, the stigma at this stage (Fig. 1C.) being rudimentary. The stigma is surrounded by a brush of stiff hairs which serves to sweep out the pollen, gradually, as the style elongates. There is no control over this process in the majority of *Lobeliaceae*, but in *Isotoma* the tips of the three upper anthers are bent downwards onto those of the lower pair forming a pair of lips (Fig. 1D.), which normally are pressed against one another. The lower lip is bearded with a few small hairs and a pair of long bristle-like hairs which are placed side by side and so close together in *I. axillaris* as to appear like one to a casual observer. Depression of these trigger hairs opens slightly the mouth of the anther tube. The pollen mass inside the anther tube is under pressure from the growing style and its stigmatic brush, so that pollen is extruded through the mouth, when it is opened. The flower remains for several days in this condition and pollen is not lost from the anther tube. The pollen mass is compacted against the arching tips of the three upper anthers, which close the tube. Ultimately, the style breaks through the end of the anther tube and the stigmas mature, enlarging to about five times their original dimensions (Fig. 1B.). If not pollinated, the flower may remain apparently receptive for several days after the stigmas have been exserted, under greenhouse conditions.

Brief mention is made by Mueller, 'Fertilisation of flowers' and Kunth, 'Handbook of flower pollination' of the pollination mechanism of *Isotoma*. Both authors obtained their facts from F. Hildebrand's illustrated account (Bot. Zeit. **27**, 476–7, figs. 8–12: 1869), which was based upon his personal observations. Although this information was available, use had not been made of it in considering the circumscription of *Isotoma* and related genera.

* Continued from Kew Bull. **13**, 401 (1959)

Wimmer in his account of the *Campanulaceae–Lobelioïdeae* (Pflanzenreich **4** (2), 398: 1953) united *Isotoma* with *Laurentia*, in which he also included *Palmerella* and *Hippobroma*. The *Isotoma* pollination mechanism appeared to be the most advanced type to be found in the *Lobeliaceae*. The trigger-hairs are developed in all of the Australian species attributed to *Isotoma* and mark them off as a specialised and clearly recognisable group.

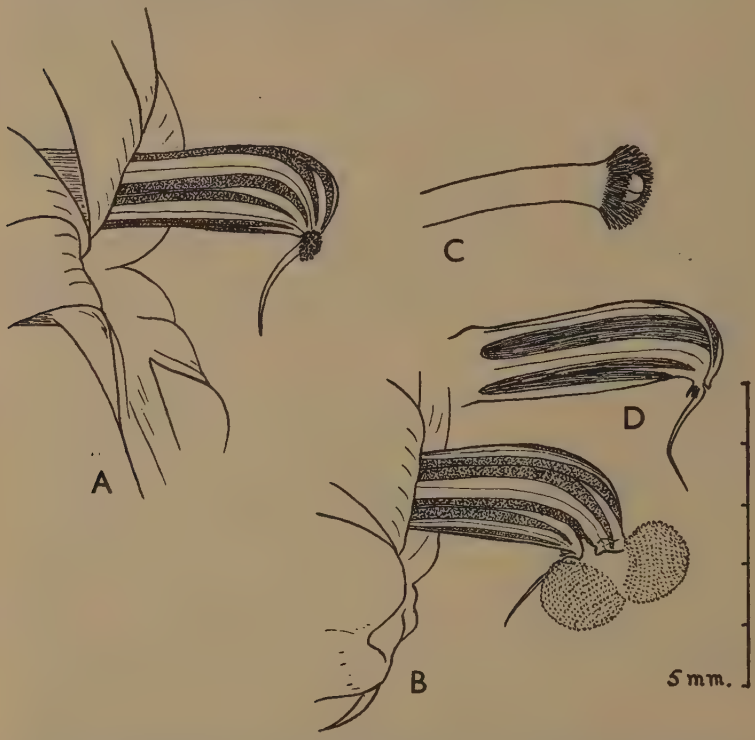

Fig. 1. Pollination Mechanism of *Isotoma axillaris* Lindl. A, The anther-tube showing trigger-hairs and an extruded mass of pollen. B, Later phase with anther-tube burst and stigmas developed. C, Tip of style with pollen-brush and immature stigmas from A. D, Anther-tube cut longitudinally to show the appressed lips, from A. All same scale.

Among other plants attributed to *Isotoma* by some authors are *Hippobroma longiflora* (L.) G. Don (*I. longiflora* (L.) Presl) and *Lobelia dunnii* Greene (*Palmerella debilis* A. Gray), which McVaugh placed in *Isotoma* as a section of *Lobelia* (Bull. Torr. Bot. Cl. **67**, 794: 1940). Both of these plants lack the trigger-hairs and distinctive pollination mechanism of true *Isotoma*. They possess only an undifferentiated tuft of hairs at the mouth of the anther-tube. *Hippobroma* is separated as a monotypic genus by McVaugh, who includes among his key-characters the 'corolla pure white, salverform, the tube narrowly cylindric, 50–135 mm. long, the lobes subequal' and 'seeds conspicuously foveolate reticulate'. As a discriminant from *Isotoma*, the seed-character breaks down for 'foveolate reticulate' seeds occur in *I. axillaris*

Lindl., *I. petraea* F. Muell. and *I. anethifolia* Summerhayes. Smooth lustrous seeds, included by McVaugh among the characters distinguishing *Isotoma*, occur in *I. pusilla* Benth., *I. scapigera* G. Don and *I. hypocrateriformis* (R. Br.) Druce, while seeds of *I. fluviatilis* (R. Br.) F. Muell. ex Benth. have a somewhat intermediate texture. Neither seed surface nor shape, which varies in *Isotoma*, appear to be useful in this alliance at the generic level. *Hippobroma* shares with *Isotoma* the character 'all stamens inserted on the corolla-tube', but it can be distinguished by the corolla characters mentioned by McVaugh combined with the undifferentiated tuft of hairs at the mouth of the anther-tube.

Although Munz in his recent 'Flora of California' has followed McVaugh in maintaining *Lobelia dunnii* Greene, Wimmer ('Das Pflanzenreich') placed the plant under *Laurentia* in his monotypic section *Palmerella*. The flowers have an undifferentiated tuft of hairs at the mouth of the anther-tube and it is, clearly, not an *Isotoma*, as McVaugh had suggested. Moreover, it appears from herbarium specimens that the base of the corolla-tube is frequently, if not invariably, split in several places, whereas the tube is entire in *Isotoma*. Possibly a fresh investigation would provide evidence for reinstating *Palmerella* as a genus.

In the genus *Lysipomia* the two lower stamens are bearded and may have a pair of larger hairs protruding beyond the remainder. Observations should be made on living plants to determine whether they possess a pollination mechanism similar to that of *Isotoma*. *L. laciniata* A. DC. was referred to *Isotoma* by Schlechtendal as *I. fasciculata* Schlechtend., but the genus *Lysipomia* is distinct from *Isotoma* in habit and in the pyxidiate dehiscence of the capsule. Thus, it appears that when the several extraneous elements mistakenly referred to *Isotoma* are removed from it, the genus stands apart as an easily recognisable taxon. It is distinguished by the relatively long, undivided corolla-tube, slight zygomorphy, all stamens inserted on the corolla-tube, the upper three anthers curved downwards at their tips against the lower pair forming a closed mouth and the lower pair of anthers bearded at the mouth of the anther-tube and having a pair of long specialised hairs which serve as a lever to open the mouth. *Isotoma* is confined to Australia except for the one species, *I. fluviatilis*, which also occurs in New Zealand. It was first defined as a genus by Lindley in Bot. Reg. **12**, t. 964 (1.4.1826) when he described *I. axillaris*, the holotype of the generic name. Subsequently the genus was adequately characterised by Bentham and Hooker, Gen. Plant. **2**, 548 (1876).

Japanese garden construction.—Through the kindness of Mr. Kaji Domoto we have recently received a copy of a rare book on 'Japanese Garden Construction' by Samuel Newsom published in 1939. The stock of this work (books and plates) was destroyed during the war with the exception of 20 copies which were in Mr. Domoto's house. In this book the author presents the subject step by step by means of diagrams, explanatory text, and photographs. He has tried to include everything of interest to the amateur, as well as the professional garden designer.

H. S. Marshall

Notes on African *Commelinaceae*: II*

J. P. M. Brenan

THE GENUS BUFORRESTIA C. B. CL. AND A NEW RELATED GENUS, STANFIELDIELLA BRENAN

The genus *Buforrestia* C. B. Cl. was founded by Clarke in DC., Monogr. Phan. **3**, 233 (1881). Four species were included in the genus: two, *B. mannii* C. B. Cl. and *B. candolleana* C. B. Cl., without doubt; one, *B. tenuis* C. B. Cl., with a question mark; and the fourth, *B. imperforata* C. B. Cl., separated from the rest under the significant heading '*Species a genere aliena*', with the remark 'Haec species habitu atque inflorescentia a Buforrestia distincta, forsan melius generice separanda est; sed capsula et stamina congruunt'.

One of the questionable species, *B. tenuis*, was transferred to *Forrestia* by Bentham in Benth. & Hook. f., Gen. Pl. **3**, 851 (1883), and this judgement was accepted by Clarke in his subsequent treatment of the African *Commelinaceae* in Fl. Trop. Afr. **8**, 77 (1901). With this species we need not concern ourselves any more here.

The genus *Buforrestia* in the 'Flora of Tropical Africa', **8**, 76 (1901) comprised according to Clarke two African species, *B. mannii* and *B. imperforata*. The grave doubts expressed about the genus of *B. imperforata* by Clarke in 1881 seem to have been dispelled entirely, there being no indication of any question about its position.

And there, except for the addition of three species to *Buforrestia*, the matter rested, and Clarke's concept of the genus as expressed in 1901 was accepted without question, e.g. by Brückner in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, **15a**, 169 (1930); by De Wildeman, Pl. Bequaert. **5**, 223 (1931); by Hutchinson & Dalziel, Fl. W. Trop. Afr. **2**, 309 (1936); by Pichon in Not. Syst. **12**, 283 (1946); and by Hutchinson, Fam. Fl. Pl., ed. 2, **2**, 566 (1959).

Within the last few years Mr. D. P. Stanfield, then at St. Mary's College, Owo, Nigeria, has been making most careful, accurate and detailed observations on the Nigerian *Commelinaceae* alive and in their natural habitats. His work will be quite indispensable for any future revision of this family in West Africa. His observations on *Buforrestia mannii* and *B. imperforata* have revealed important floral differences between the two species which, owing to the poverty of material of *B. mannii*, had been previously unknown. In the light of these, Clarke's original doubts about the position of *B. imperforata* take on a new significance. The species hitherto referred to *Buforrestia* have been therefore reinvestigated and Mr. Stanfield's expressed opinion that two distinct genera are here involved is fully confirmed. One of the genera is *Buforrestia* C. B. Cl. proper, the other, for which no previous name is available, it seems altogether appropriate to call *Stanfieldiella* (the name *Stanfieldia* having already been used for a genus of *Compositae*).

At this stage some comments on the typification of *Buforrestia* are desirable. Of the four original species only two, *B. mannii* and *B. candolleana*, were

* Continued from Kew Bull. **7**, 208 (1952).

accepted by Clarke at the time as being certain members of the genus, and one of them must therefore be the lectotype. No previous choice seems to have been made, and both the candidate species were about equally known to Clarke. *B. mannii* was, however, made the subject of a plate (t. 6) in DC., Monogr. Phan. **3** (1881), there is recent good material of it from West Africa, and its floral structure is, thanks to Mr. Stanfield, well known. *B. candolleana* was not illustrated by Clarke, little has been added recently to our knowledge of this species, and it is represented at Kew only by a single specimen more than a century old and with buds so few that I hesitate to dissect any. For these reasons, I propose *B. mannii* as the lectotype of the genus.

The contrasting characters of *Buforrestia* and *Stanfieldiella* are given in Table 1 and are illustrated in the figure on p. 282.

TABLE 1. Diagnostic characters of *Buforrestia* and *Stanfieldiella*

Buforrestia	*Stanfieldiella*
Inflorescences perforating the leaf-sheaths, of sessile bracteate clusters of pedicellate flowers borne at intervals along a simple or forked main inflorescence-axis.	Inflorescences never perforating the leaf-sheaths, of forked or cymosely branched racemes, produced singly or clustered, terminal or in upper axils.
Flowers clustered up to about 10 together at nodes of inflorescence.	Flowers single at nodes of inflorescence.
Sepals strongly accrescent.	Sepals not or scarcely accrescent.
Petals unequal, the anticous (lower) one broader than the other two subsequal ones, its margins upwardly turned, overlapping the other two petals in bud and as it were forming a shallow cup under the stamens in flower.	Petals equal, the anticous one without conspicuously upturned margins.
Stamens unequal; the filaments of the two lateral ones arcuate and conspicuously dilated above.	Stamens equal or almost so; filaments straight or nearly so, not dilated above.
Style very short, conical, tapering from the ovary.	Style long, filiform, clearly distinct from the ovary.

Buforrestia *C. B. Cl.* in DC., Monogr., Phan. **3**, 233 (1881), hic emend.

Herbae satis robustae, glabrae vel subglabrae. Folia elliptica usque anguste elliptica. Pedunculi axillares, basim vaginae perforantes. Inflorescentiae simplices vel 1–2-furcatae, nodos paucos gerentes. Flores pedicellati, ad nodos usque ad circiter 10 fasciculati. Sepala 3, subaequalia,

Fig. 1. For caption see opposite.

fructifera valde accrescentia quam capsula longiora, quorum unum quam alia paulum brevius. Petals 3, libera; anticum (inferius) quam alia latius, marginibus sursum inflexis et stamina laxe amplectentibus. Stamina 6, inaequalia, filamentis eorum lateralium valde S-arcuatis et superne manifeste dilatatis. Stylus brevissimus, conicus, basi in ovarii apicem sensim dilatatus. Capsula oblonga, apice acuta, trivalvis. Semina in utroque loculo 4–8, verrucosa, plerumque plus minusve quadrata.

Lectotypus generis: *B. mannii* C. B. Cl.

The above generic description is based mainly on *B. mannii*. As previously stated, the only specimen of *B. candolleana* that I have seen is insufficient to permit dissection. Its external features, however, give no evidence against its being a true *Buforrestia*.

Inflorescences 5–15 cm. long, with 2–11 nodes; leaves 4·5–11·2 cm. wide; sepals in fruit 10–17 mm. long . . . . . 1. *B. mannii*

Inflorescences 1–2(–6, *fide* Uittien) cm. long, with 1–2 nodes; leaves 3–4·2 (–5, *fide* Uittien) cm. wide; sepals in fruit up to 22 mm. long 2. *B. candolleana*

1. **Buforrestia mannii** *C. B. Cl.* in DC., Monogr. Phan. **3**, 233, t. 6 (1881); C. B. Cl. in Thiselton-Dyer, Fl. Trop. Afr. **8**, 76 (1901); Brückner in Engl. et Prantl, Nat. Pflanzenfam., ed. 2, **15a**, 169 (1930); De Wild., Pl. Bequaert. **5**, 228 (1931); Hutchinson et Dalziel, Fl. W. Trop. Afr. **2**, 309, fig. 284 (1936).

Liberia, *Linder* 561, but see note below; Nigeria, *Richards* 5134, *Stanfield* 45, 51, 103; British Cameroons, *Brenan & Richards* 9469; Fernando Po, *Mann* 96, holotypus; French Cameroons, *Zenker* 4085, 4654, 4974.

Linder 561 diverges somewhat from the rest in having more pubescence on the leaf-sheaths and inflorescences, and in being lower in growth. More material is needed to show if it is taxonomically worth separation.

2. **Buforrestia candolleana** *C. B. Cl.* in DC., Monogr. Phan. **3**, 233 (1881); Brückner in Engl. et Prantl, Nat. Pflanzenfam., ed. 2, **15a**, 169 (1930); Uittien in Pulle, Fl. Suriname **1**(1), 201 (1938); Lemée, Fl. Guyane Franç. **1**, 311 (1955).

French Guiana, *Herb. Rothery*; other specimens (syntypes) in Herb. De Candolle cited by C. B. Clarke; also in Suriname (*fide* Uittien, *l.c.*).

Stanfieldiella *Brenan*, gen. nov.

Herbae tenues usque modice robustae, fere glabrae usque satis dense pilosae. Folia anguste elliptica usque elliptica. Inflorescentiae vaginas

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Fig. 1. *Buforrestia mannii*—1, node of stem, showing leaf-sheath perforated by peduncle of inflorescence, × 1; 2, part of inflorescence, × 2; 3, node of inflorescence, showing scars left by pedicels of fallen flowers, × 2; 4, flower, × 3; 5, anticous (lower) petal, × 6; 6, posticous (upper) petal, × 6; 7, flower (petals removed), showing stamens and ovary, × 6; 8, stamens, lateral one on left, × 6; 9, capsule with persistent accrescent sepals, × 3; 10, seed, × 10. Drawn from *Stanfield* 45, Nigeria.

Stanfieldiella imperforata—11, inflorescence, × 1; 12, part of inflorescence, showing single arrangement of pedicels, × 2; 13, flower, × 3; 14, flower, opened out, × 6; 15, petal, × 6; 16, stamen, × 6; 17, capsule, × 3; 18, seeds, × 10. Drawn from *Brenan & Richards* 8832, Nigeria.

nunquam perforantes, axillares vel ut videtur terminales, saepe prope apicem caulis aggregati, semel vel parce et saepe inferne dichotomae vel furcatae, ramis plus minusve elongatis (raro valde abbreviatis) flores pedicellatos racemosim ferentibus. Flores ad nodos singuli. Sepala 3, aequalia, non vel vix accrescentia. Petala 3, libera, aequalia, oblongo-spathulata usque elliptica, marginibus non inflexis. Stamina 6, subaequalia, filamentis rectis. Stylus elongatus, ab ovario distinctus. Capsula lineari-oblonga, oblonga vel ellipsoidea, apice obtusa vel apiculata, trivalvis. Semina in utroque loculo 2–10, laevia vel verrucosa, plerumque plus minusve quadrata.

Typus generis: *S. imperforata* (C. B. Cl.) Brenan.

Inflorescences terminal or ± aggregated near tops of the erect or suberect flowering stems (lateral inflorescences may be present in addition); hairs or pedicels and outside of sepals (when present) 0·25–1 mm. long:
- Seeds 4–10 per loculus, smooth or (? in *S. oligantha*) verrucose; capsule much exceeding sepals:
  - Terminal inflorescence or cluster of inflorescences usually 3–8 cm. wide; leaves not or scarcely aggregated into an apical rosette, usually (not always) not more than about 13 cm. long; capsule 1·5–2 mm. wide:
    - Outside of sepals and pedicels pubescent with gland-tipped hairs 0·5–1 mm. long . . . . . 1. *S. imperforata* var. *imperforata*
    - Outside of sepals and pedicels glabrous 1. *S. imperforata* var. *glabrisepala*
  - Terminal inflorescence or cluster of inflorescences small and compact, about 2 cm. long and wide; upper leaves mostly aggregated into apical rosettes, mostly large, 10–16 cm. long; capsule 2·5–3 mm. wide . . . . . 2. *S. oligantha*
- Seeds 2–4 per loculus, verrucose; capsule not or scarcely exceeding sepals; inflorescence pubescent with gland-tipped hairs 0·25–0·5 mm. long:
  - Leaf-sheaths setose-ciliate on margins but not spreading-villous outside; lamina glabrous, or sparingly puberulous beneath 3. *S. brachycarpa* var. *brachycarpa*
  - Leaf-sheaths densely spreading-villous outside; lamina rather densely appressed-hairy on both surfaces . 3. *S. brachycarpa* var. *hirsuta*

Inflorescences all lateral and scattered, not terminal or aggregated near top of flowering stem; stems creeping; pedicels and outside of sepals pubescent with short hairs less than 0·25 mm. long . . 4. *S. sp.*

1. **Stanfieldiella imperforata** (*C. B. Cl.*) *Brenan*, comb. nov.

var. **imperforata**

Buforrestia imperforata C. B. Cl. in DC., Monogr. Phan. **3**, 234, t. 7 (1881); C. B. Cl. in Thiselton-Dyer, Fl. Trop. Afr. **8**, 76 (1901); Brückner in Engl. et Prantl, Nat. Pflanzenfam., ed. 2, **15a**, 169 (1930); De Wild., Pl. Bequaert. **5**, 227 (1931); Hutchinson et Dalziel, Fl. W. Trop. Afr. **2**, 309 (1936)

B. minor K. Schum. in Engl., Pflanzenw. Ost-Afr. **C**, 136 (1895)

Sierra Leone, *Scott Elliot* 4678, p.p., *N. W. Thomas* 4116; Liberia, *Linder* 174, 732; Ivory Coast, *Chevalier* 22466; Ghana, *Deighton* 3420, *Irvine* 442, 1317, *Johnson* 600, *Vigne* 1886a; Nigeria, *Brenan* 8508, 8832, *Keay in F.H.I.*

28068, *Kennedy* 420, 1416, 2664, *Meikle* 512, 567, p.p., *Stanfield* 28, 44, p.p.; British Cameroons, *Mann* 1340, syntype, *Migeod* 252, *Mildbraed* 10562; French Cameroons, *Bates* 145, 258, *Mildbraed* 8893, *Staudt* 385, *Zenker* 1094, 4803; Principe, *Mann* s.n., syntype; Portuguese Congo, *Gossweiler* 7965; Belgian Congo, *Devred* 635, *Goossens* 2979, *Louis* 592, 10075, 15983, *Robyns* 804; Uganda, *Purseglove* 1755, *A. S. Thomas* 12, 927; Tanganyika, *Drummond & Hemsley* 3441, *Gillman* 393, *Greenway* 46, 4169, *Holst* 2280a, holotype of *Buforrestia minor* K. Schum., *Verdcourt* 216, *Verdcourt & Greenway* 46; Angola, *Fontinha* 14246, *Welwitsch* 6607.

S. imperforata var. *imperforata* is widely distributed through the lowland rain-forest regions of tropical Africa. One of the original syntypes of *S. imperforata* is a specimen without number collected by Mann on Fernando Po, which is most unusually hairy for *S. imperforata*. In fact it might well be *S. brachycarpa* var. *hirsuta* (see below), but the specimen is without capsules, and no further material is available. On this evidence it would be unsafe to record either *S. brachycarpa* or *S. imperforata* from Fernando Po.

var. **glabrisepala** (*De Wild.*) *Brenan*, comb. nov.

Buforrestia glabrisepala De Wild., Pl. Bequaert. **5**, 224 (1931); Robyns et Tournay, Fl. Spermat. Parc Nat. Albert **3**, 324, t. 46 (1955)

B. imperforata C. B. Cl. var. *glabrisepala* (De Wild.) Brenan in Troupin, Fl. Spermat. Parc Nat. Garamba **1**, 160 (1956)

Belgian Congo, *Bequaert* 1054, *Claessens* 497, *Germain* 1904, *Lebrun* 297, *Louis* 10986, 12525, *Troupin* 997; Uganda, *Chandler* 1538, *Dawkins* 356, 461, p.p. *Drummond & Hemsley* 4570, 4602, *Eggeling* 2105, *Hansford* 2286, *Loveridge* 226, *Mahon s.n.*; Tanganyika, *Gillman* 462, *Willan* 266.

The var. *glabrisepala* has a more limited distribution than var. *imperforata*, occurring in the Belgian Congo, Uganda, and north-western Tanganyika. De Wildeman cited very numerous syntypes of *Buforrestia glabrisepala*, including the first two Belgian Congo specimens mentioned above.

2. **Stanfieldiella oligantha** (*Mildbr.*) *Brenan*, comb. nov.

Buforrestia oligantha Mildbr. in Notizbl. Bot. Gart. Berlin **9**, 258 (1925); Brückner in Engl. et Prantl, Nat. Pflanzenfam., ed. 2, **15a**, 169 (1930); De Wild., Pl. Bequaert **5**, 228 (1931)

French Cameroons, *Mildbraed* 5730, holotype.

I have seen no certain material of this species except the holotype; more is much desired. Some Nigerian and British Cameroons specimens, examples of which are *Meikle* 567, p.p., *Stanfield* 28, 44, p.p., *Preuss* 1297, looking like *S. imperforata* but with more compact inflorescences and verrucose seeds, are possibly *S. oligantha*, but more material is needed.

3. **Stanfieldiella brachycarpa** (*Gilg et Lederm. ex Mildbr.*) *Brenan*, comb. nov.

var. **brachycarpa**

Buforrestia brachycarpa Gilg et Lederm. ex Mildbr. in Notizbl. Bot. Gart. Berlin **9**, 258 (1925); Brückner in Engl. et Prantl, Nat. Pflanzenfam., ed. 2. **15a**, 169 (1930); De Wild., Pl. Bequaert. **5**, 224 (1931)

French Cameroons, *Ledermann* 958, syntype; the other syntypes, *Ledermann* 800 and *Mildbraed* 4353, are destroyed.

var. **hirsuta** (*Brenan*) *Brenan*, comb. nov.

Buforrestia brachycarpa Gilg et Lederm. ex Mildbr. var. *hirsuta* Brenan in Kew Bull. **7**, 455 (1953)

Nigeria, *Brenan* 8486, *Brenan & Onochie* 9090, holotype of the variety.

4. **Stanfieldiella sp.**

Nigeria, Benin Division, Usonigbe Forest Reserve, 14 Nov. 1949, *Meikle* 566.

As indicated by the key above, this seems amply distinct from the other species of the genus, and is probably a new species. It seems preferable, however, that it should not be formally described and named until further material with capsules and seeds which are at present unknown, is available. Dr. J. K. Morton informs me that it also occurs in Ghana.

I am indebted to Miss S. A. Sutton for drawing the illustration of this paper.

Soil-less cultivation of plants.*—For more than a century, sand and water culture have been accepted laboratory methods for the study of plant nutrition. In the 1930's, these techniques of the plant physiologist were applied to horticulture, and Professor Gericke produced sensational results under the favourable conditions of California. The methods practised in this country and America were too expensive and elaborate for general adoption in India, and a simplified system has been evolved there.

The Bengal system of hydroponics is described by J. Sholto Douglas in this straightforward popular account. With this guide and its descriptive photographs and diagrams, the layman, or the expert horticulturalist, can construct and maintain a 'do-it-yourself' hydroponicum to grow his own produce in conditions otherwise unsuitable. Troughs containing an aggregate for root support may be made from simple local materials. The only other requisites are water, air and light. A section headed 'what to do when things go wrong' optimistically anticipates a variety of snags.

The system is widely successful in India, producing crops of wheat, oats, maize, rice, tomatoes and lettuce. Soil-less cultivation has great possibilities in fair climates where the soil is deficient, but it is hardly a panacea for the world's food problems, as the author appears to hope. It is, however, interesting to note that hydroponics produced fresh salads and vegetables on Wake Island during the War and at the Base Camp of the Commonwealth Trans-Antarctic Expedition. A lunar hydroponicum has now been designed to supply space travellers.

M. Y. Stant

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* *Hydroponics—The Bengal System.* By J. Sholto Douglas. Third Edition. Pp. xix + 144, 23 half-tone plates (35 photographs), 15 text-figures. Bombay, and elsewhere: The Oxford University Press, 1959. Price 12/6.

Indigofera: new taxa from Central Africa

J. B. Gillett

I. atriceps *Hook. f.* subsp. **ramosa** (*Cronquist*) *Gillett*, stat. nov.

I. ramosa Cronquist in Bull. Jard. Bot. Brux. **22**, 224 (1952) & Fl. Congo Belge **5**, 142 (1954); Gillett in Kew Bull., Add. Ser. **1**, 80 (1958)
Type: Urundi, Kisozi, *Lejeune* 257 (BR, holotype, K, isotype)

I. atriceps *Hook.f.* subsp. **ufipaënsis** *Gillett*, subsp. nov.

Herba perennis, vel forsan interdum annua, ad 1 m. alta, ubique et pilis erectis multicellularibus glandulosis 0·5–2·5 mm. longis et pilis biramosis subappressis setosis albis vel, praecipue ad inflorescentiam, atro-brunneis induta. *Folii* rhachis ad 14 mm. longa, petiolo ad 6 mm. longo incluso, ultra foliola lateralia 0–3 mm. prolongata; stipulae linearo-lanceolatae, falcatae, ad 6 mm. longae; foliola 3–7, saepius 5, cuneato-obovata vel elliptica vel lanceolata, apice rotundata vel acuta, apiculata. *Racemi* ad 6 [8] cm. longi (fructiferi haud visi forsan longiores), pedunculo ad 2 cm. longo incluso; bracteae linearo-lanceolatae, caducae, ad 5 mm. longae; pedicelli patentes 2–2·5 mm. longi. *Calyx* atro-brunneo-setosus, tubo c. 1 mm. longo, lobis subulatis c. 4 mm. longis. *Corolla* extus atro-setosus, pilos multi-cellulares glandulosos ad 1 mm. longos ad axem mediam vexilli carinaeque etiam exhibens; vexillum ovoideum, apice apiculatum, 6 mm. longum, 5 mm. latum; carina apice rotundata. *Stamina* 6 mm. longa, antheris 0·7 mm. longis. *Ovarium* 2 mm. longum, c. 7-ovulatum; stylus 5·5 mm. longus, 4 mm. supra basin per 90° curvatus; stigma globosum, 0·5 mm. diametro. *Legumen* valde immaturum atro-setosum et pilis glandulosis longis obsitum.

Tanganyika. Ufipa District: Mbisi, 2250 m., among grasses on rocky slope near a summit, suberect, corolla red, 2 Apr. 1950, *A. A. Bullock* 2789 (K, holotype). Mbisi Forest, 2100 m., at edge of forest, 1 m. tall bushy plant, corolla crimson, 17 Mar. 1959, *Mrs. H. M. Richards* 12201. Malonje Plateau, 2100 m., in short grassland on damp peaty soil, corolla crimson, 4 Feb. 1957, *Mrs. H. M. Richards* 8433. Malonje Plateau, Nsanga Mt., 2100 m., in grass among rocks, herbaceous bushy plant, corolla crimson-rose, 13 Mar. 1959, *Mrs. H. M. Richards* 12126 and in grassland at edge of forest, *Mrs. H. M. Richards* 12133.

Mrs. Richards 12201 closely resembles *Bullock* 2789 from the same locality. The three specimens from Malonje Plateau, some 15 km. to the north, all have more slender and erect stems.

In an earlier account (Gillett, *l.c.* 80) *I. ramosa* was, after some hesitation, kept up as a species while *Bullock* 2789 was referred to as perhaps representing an undescribed species. A closer study of the wealth of variation in *I. atriceps* Hook.f. subsp. *alboglandulosa* (Engl.) Gillett shows that the difference between this taxon and *I. ramosa*, consisting as it does chiefly in the shorter leaves and the longer glandular indumentum of the flowers, cannot plausibly be regarded as of more than subspecific value. The delimitation of *I. atriceps* was thus extended to include plants with 3–7 leaflets and when the addition of further material showed the Ufipa plant to be a well defined taxon it fitted into place as yet another subspecies of the very polymorphic *I. atriceps*, differing from subsp. *ramosa* in its much stouter stems, and larger leaflets and flowers.

I. longepedicellata *Gillett*, sp. nov.

Herba perennis, ramulis prostratis, subrubris, obscure angulatis, sparse albo-pilosis, interdum etiam glandulis rubris sessilibus obsitis. *Foliorum* rhachis tenella, sparse pilosa, ad 23 mm. longa, petiolo ad 2 mm. longo incluso, ultra foliola lateralia 1–2 mm. prolongata; stipulae subulatae c. 2 mm. longae; stipellae desunt, sed pili perpauci breves rubri glandulosi in loco earum adsunt; petioli 0·5 mm. longi; foliola 9–15, opposita, elliptica, ad 4·5 mm. longa et 2·5 mm. lata, supra glabra, infra sparse albo-pilosa, pilis ad 0·7 mm. longis, simplicibus vel uno ramo alio multo breviore. *Racemis* axillares, 3–12-flori, sparse albo-pilosi, glandulis rubris sessilibus plus minusve obsiti, ad 5 cm. longi, pedunculo ad 2·5 cm. longo incluso; bracteae lanceolatae, ad 1·2 mm. longae, persistentes; pedicelli atro-rubri, sparse pilosi, ad anthesin ad 5 mm. longi, fructu ad 7 mm. longi et patentes. *Calyx* atro-rubus, sparse albo-pilosus, tubo 1 mm. longo, lobis ad 2 mm. longis, basin deltoideis, superne in acumen subulatum productis. *Corolla* rubra, extus breviter albo-pubescens. *Filamenta* 5 mm. longa. *Ovarium* glabrum; stylus c. 2·7 mm. longus, 1 mm. supra basin curvatus; stigma minutum, globosum. [*Legumen* teres, glabrum, rubo-atrum, ad 2 cm. longum, c. 2 mm. latum, stylo persistente curvato 2–3 mm. longo rostratum; endocarpium maculatum; semina (haud matura) c. 6, laevia, anguste reniformia.]

Southern Rhodesia. Inyanga District: Summit ridge of Inyangani, 2520 m., small scarlet-flowered prostrate plant, Apr. 1935, *H. B. Gilliland* Q 1907 (K, BM). Same locality, 2100–2400 m., flowers crimson, 3 Mar. 1956, *J. Whellan & R. M. Davies* 1002 (K, holotype, SRGH, isotype).

This species belongs to subsection *Psiloceratiae* (Gillett, *l.c.* 84). No closely related species has been found from South Africa. In tropical Africa the nearest species is *I. longemucronata* Bak.f. from the Kenya-Tanganyika coastal mountains, which however has much longer flowers, leaves and fruits. *Perrier de la Bathie* 12401 from near Ambatofongana at 1800 m. in Madagascar, wrongly identified as *I. pedunculata* Hils. & Boj. ex Baker and apparently belonging to some undescribed species, is much more closely related, but has a shorter indumentum, leaflets pubescent above and pedicels not above 3·5 mm. long and reflexed after flowering.

British Lichens.*—The lichenised fungi form important and often conspicuous components of the plant cover in all parts of the globe where the atmosphere is not polluted by industrial fumes. They are among the earliest pioneers on bare rock-faces and thrive at higher altitudes and latitudes, especially in the Antarctic, than other plants. Unfortunately, unlike some non-lichenised fungi, they are not known to cause injury or disease to man, his crops, or his herds, nor have they yet been used as source of an antibiotic substance or cultivated for industrial purposes. In a word, there is no money in lichens and consequently, though their study was popular with the parish clergy and country gentlemen of the 18th and 19th centuries, it has now almost died out in the British Isles. It is encouraging, therefore, to see the publication of this attractive little handbook, by one of the small band of lichenologists who still linger in the remoter parts of the country.

* *A guide to the study of Lichens.* By U. K. Duncan. Pp. xxvii + 164, 19 plates (41 photographs). Arbroath: T. Buncle & Co., 1959. Price 25/-.

Keys are provided to the 158 genera recorded from Great Britain and Ireland, one species of each genus is described in some detail and brief notes are given on the distinctive features of the remaining species listed in Watson's 'Census Catalogue'. 41 species are illustrated in their natural habitat by 40 excellent photographs carefully selected to show the characteristic habit of the plants. These should be of considerable assistance to field botanists.

R. W. G. Dennis

The genus Oenothera.*—Although catenation (i.e. the formation of chromosome rings at meiosis as a result of segmental interchanges) is known to occur in other genera, only in *Oenothera* has it been accompanied by a balanced lethal system which produces true-breeding structural hybrids and allows the inheritance as genetical units of complexes comprising up to seven chromosomes. Indeed, in this distillation of forty years' researches on *Oenothera*, the author shows how the course of evolution in the genus was completely altered by the appearance of this mode of inheritance.

An introductory chapter dealing with evolutionary processes and trends (both morphological and geographical) in *Oenothera* and the rest of the *Onagraceae* includes, among other things, an interesting discussion of the relationship between genetics and taxonomy. There follows the main part of the book under the general heading of 'taxonomy'. This chapter, however, does not contain a systematic account of the genus—the author has provided this elsewhere—but rather an examination of the morphological variation in each species, and its status and relationships in the light of experimental work carried out by Dr. Gates and other workers. In common with other monographers of genera whose work was partly experimental (e.g. Babcock on *Crepis* and Goodspeed on *Nicotiana*), the author has much of interest to say about the genetical basis of various taxonomic characters. The observations on variation within and between populations are based on what must surely be one of the most extensive culture programmes yet carried out. Not content merely to obtain seed from wild populations and compare the resultant plants, Dr. Gates has frequently continued selfing and crossing experiments through several generations. In conjunction with measurements and observations, this has provided the basis for a reassessment of the status of several populations which had been given specific or varietal rank. Although the author assumes a general acquaintence with the genus, the two maps and twenty photographs help to make this chapter more immediately understandable than it otherwise would be. Dr. Gates' concluding chapter, which deals with points of cytological or genetical interest that have emerged during the study of *Oenothera*, provides a very useful bibliographical review of work in those aspects of the subject.

The printing errors are rather more numerous than one would expect in a work of this type; but none are likely to mislead the reader, unless anyone can imagine that Linnaeus' 'Hortus Cliffortianus' was published in 1937 (p. 54)! Such slips, however, detract little or nothing from the value of this book, which may well become one of the classics of experimental taxonomy.

N. K. B. Robson

* *Taxonomy and Genetics of Oenothera.* Monographiae Biologicae, vol. VII. By R. Ruggles Gates. Pp. 115, 20 half-tone figures, 2 maps. The Hague: W. Junk, 1958. 14 guilders.

Indigofera hirsuta L. & *I. astragalina* DC.

J. B. Gillett

Dr. S. I. Ali of Karachi has recently published (Bot. Notiser **3**, 543–577: 1958) a valuable account of the species of *Indigofera* found in West Pakistan and NW. Himalayas. This is part of a much larger unpublished thesis 'A taxonomic study of the *Galegeae* of West Pakistan and the N.W. Himalayas' which I have been able to study thanks to the courtesy of Dr. Ali and of London University. Dr. Ali's thesis was prepared at Kew while my own revision of the Tropical African species of *Indigofera* (Kew Bull., Add. Series **1**: 1958) was being made, and in most cases we reached agreement on our treatment of those species which concerned both of us. However, Dr. Ali's work continued after my own was completed and in two instances his treatment of important widespread species occurring in Africa differs from my own.

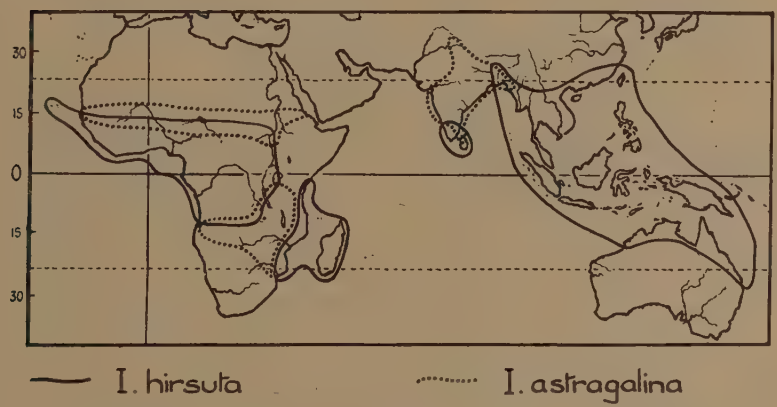
The following article is an attempt to remove these two discrepancies. Dr. Ali has been kind enough to read it in typescript and to make suggestions for its improvement, of which the test of the validity of Table 1, which is summarised in Table 2, is perhaps the chief.

In the first instance, in his treatment of *I. trita* L.f. and *I. subulata* Vahl ex Poir., Dr. Ali has, in my opinion, proved his main point: botanists must now treat *I. subulata* in all its forms as varieties of *I. trita*.

In the second instance, however, after re-examining the material, I cannot agree with Dr. Ali's statement that no characters can be used with complete success to discriminate between *I. astragalina* DC. and *I. hirsuta* L., that no correlation can be found between the variation of such characters and geographical distribution, and that the best treatment therefore is to recognise *I. hirsuta* (including *I. astragalina*) as a single polymorphic species. In view of the thoroughness and care shown in Dr. Ali's work it is clearly desirable that anyone disagreeing with him, who wishes to defend the traditional distinction drawn by almost all African botanists between *I. hirsuta* and *I. astragalina*, should state his evidence. This will have the further advantage of demonstrating that ponderous, erudite and laborious mathematical methods may be just as fallible as the most superficial examination if care is not taken to eliminate logical errors in their use. The characters which have been used to discriminate between *astragalina* and *hirsuta* include length of peduncle, breadth of pod, number of seeds, colour of hairs on the pod, number of leaflets and length of pod. Before handling these characters mathematically it is necessary to enumerate the material as regards each character, using 3 or more grades wherever possible. If a bimodal type of distribution appears, genetic factors are almost certainly involved; a normal unimodal curve of distribution may well be due to chance. If only two grades are used for each character we have no means of telling which type of distribution is involved, nor can we tell whether we have chosen the best dividing line as regards this character.

In Tables 1 and 3–7 the whole of the material at Kew considered to be *I. astragalina* or *I. hirsuta* or intermediate between the two has been tabulated

in this way for the characters listed above. The bimodal distribution of the totals in Tables 1 and 3–5 are apparent at a glance and leave no doubt that we are dealing with genetic factors. In order to test the correlation of these factors the 431 specimens in Table 1, with 19 exceptions, are divided into *hirsuta* (maximum peduncle length over 25 mm.) and *astragalina* (maximum peduncle length under 25 mm.). The exceptions include 1 specimen (*Schlechter* 12000) which is clearly *hirsuta* on all its characters except that its maximum peduncle length is 22 mm., this is classified as *hirsuta*, 3 incomplete specimens from West Africa and the Sudan which might be hybrids, 13 puzzling specimens (discussed below) from Angola, Northern Rhodesia and the North-eastern parts of South West Africa and two atypical plants 'x' from Australia.



Map 1. Geographical distribution of *Indigofera hirsuta* L. and *I. astragalina* DC.

It has been suggested that maximum peduncle-length is not a suitable character by which to differentiate between two groups, being perhaps unduly subject to accidental influences, and that if average peduncle-length were used instead the two groups might appear less distinct. To test this, all mature peduncles (those bearing open flowers or fruits) were measured on the 12 specimens from India proper which appear as *hirsuta* in Table 1 and also on 12 specimens from India appearing as *astragalina*, chosen at random. The results are shown in Table 2. It will be seen that the two groups remain clearly distinct.

The material is also subdivided geographically to test various hypotheses; in this connection '*India etc.*' means India, Pakistan, Ceylon and Burma; '*Angola etc.*' means Angola, Northern Rhodesia and adjacent South West Africa; '*W. Africa etc.*' means West Africa and the Sudan Republic; '*SE. Asia*' includes south China, Siam, Indochina, Indonesia, The Philippines and New Guinea.

TABLE 1. Maximum length of peduncle in mm.

	0–9	10–14	15–19	20–24	25–29	30–34	35–39	40–49	50–100	Totals
hirsuta in Australia ...	—	—	—	—	2	2	1	**12**	**11**	28
hirsuta in India, etc. ...	—	—	—	—	—	—	1	5	**11**	17
hirsuta in Angola, etc. ...	—	—	—	—	—	2	—	—	**6**	8
hirsuta elsewhere	—	—	—	1	2	5	18	49	**142**	217
astragalina in India, etc. ...	2	**26**	16	8	—	—	—	—	—	52
astragalina in Angola, etc.	3	**12**	8	4	—	—	—	—	—	27
astragalina elsewhere ...	6	**25**	**25**	8	—	—	—	—	—	64
intermediates in Angola, etc.	—	—	—	6	2	5	—	—	—	13
intermediates in W. Africa etc.	—	—	1	1	1	—	—	—	—	3
atypical from Australia ...	—	—	—	—	—	—	—	1	1	2
Totals	11	**63**	50	28	7	14	20	67	**171**	431

TABLE 2. Peduncle-length in mm., all peduncles measured on each specimen.

	No. of peduncles									
	0–9	10–14	15–19	20–24	25–29	30–34	25–39	40–49	5–100	Totals
12 specimens of										
hirsuta ...	—	—	1	—	1	5	2	11	21	41
astragalina ...	31	31	11	3	—	—	—	—	—	76

TABLE 3. Breadth of pod, measured in mm. at right-angles to the plane of the sutures.

	1·8–2·2	2·3–2·7	2·8–3·5	Totals
hirsuta in India, etc.	5	4	—	9
hirsuta in Angola, etc.	4	1	—	5
hirsuta elsewhere	178	8	—	186
astragalina in India, etc.	—	—	25	25
astragalina in Angola, etc.	—	—	13	13
astragalina elsewhere	—	—	24	24
intermediates in Angola, etc.	2	4	—	6
intermediates in W. Africa, etc. ...	2	—	—	2
atypical from Australia	—	—	2	2
Totals	191	17	64	272

TABLE 4. Maximum No. of seeds in the pod.

	2	3	4	5	6	7	8	9	Totals
hirsuta in India, etc.	—	—	—	—	2	**6**	1	1	10
hirsuta in Angola, etc.	—	—	—	—	2	1	2	—	5
hirsuta elsewhere	—	—	—	1	12	55	**73**	19	160
astragalina in W. Africa, etc. ...	1	**4**	**5**	2	1	—	—	—	13
astragalina in India, etc. ...	—	1	1	**21**	7	—	—	—	30
astragalina in Angola, etc. ...	—	—	4	**12**	—	—	—	—	16
astragalina elsewhere	—	—	—	**13**	4	1	—	—	18
intermediates in Angola, etc. ...	—	—	—	3	7	—	—	—	10
intermediates elsewhere	—	—	—	—	—	—	—	—	0
atypical from Australia ...	—	—	1	—	—	1	—	—	2
Totals	1	5	11	**52**	35	64	**76**	20	264

TABLE 5. Colour of hairs on dorsal side of pod.

	Dark	Inter-mediate	White	Totals
hirsuta in Australia	10	7	9	26
hirsuta in SE. Asia	25	7	11	43
hirsuta in India, etc.	10	1	1	12
hirsuta in Angola, etc.	7	—	—	7
hirsuta elsewhere	106	13	11	130
astragalina in W. Africa, etc.	—	1	14	15
astragalina in India, etc.	3	5	28	36
astragalina in Angola, etc.	3	3	12	18
astragalina elsewhere	8	3	12	23
intermediates in Angola, etc.	10	2	1	13
intermediates in W. Africa, etc. ...	1	1	1	3
atypical from Australia	—	—	2	2
Totals	183	43	102	328

TABLE 6. Maximum No. of leaflet-pairs on any one leaf.

	2	3	4	5	6	Totals
hirsuta in Australia	—	**13**	**14**	1	—	28
hirsuta in India, etc.	—	**10**	7	—	—	17
hirsuta in Angola, etc.	—	**5**	3	—	—	8
hirsuta elsewhere	12	**171**	34	—	—	217
astragalina in India, etc.	3	9	**28**	12	—	52
astragalina in Angola, etc.	—	7	**15**	5	—	27
astragalina elsewhere	—	6	**34**	22	1	63
intermediates in Angola, etc.	—	3	**8**	2	—	13
intermediates in W. Africa, etc.	3	—	—	—	—	3
atypical from Australia	—	1	—	1	—	2
Totals	18	225	143	43	1	430

TABLE 7. Maximum length of pod in mm.

	under 12	12–13	14–15	16–17	18–19	20–21	over 21	Totals
hirsuta in SE. Asia and Australia	—	—	1	23	**26**	18	1	69
hirsuta in India, etc.	—	—	2	2	4	—	—	9
hirsuta in Angola, etc. ...	—	—	2	1	1	1	—	5
hirsuta elsewhere	—	2	24	**42**	25	9	—	102
astragalina in W. Africa, etc. ...	1	**8**	2	1	—	—	—	12
astragalina in India, etc. ...	1	—	5	**15**	6	1	—	28
astragalina in Angola, etc. ...	—	2	**10**	4	—	—	—	16
astragalina elsewhere ...	—	2	**11**	2	2	2	—	19
intermediates in Angola, etc. ...	1	**5**	3	—	—	—	—	9
intermediates in W. Africa, etc.	—	—	—	1	—	—	—	1
atypical from Australia ...	—	1	—	—	—	—	1	2
Totals	3	20	60	92	64	31	2	272

It is apparent from Table 3 that, apart from the few exceptions mentioned above, there is a complete correlation between broad pods and short peduncles, since the specimens were classed as *astragalina* or *hirsuta* simply on the basis of their shorter or longer peduncles. It is also clear from tables 4–6 that *hirsuta* and *astragalina* differ significantly in seed-number, leaflet-number and the colour of hairs on the pod although they overlap in these characters. Table 7 shows that pod length is of less use as a distinguishing feature. It is also apparent that intermediates, hybrids or other specimens difficult to assign to either taxon are confined to a small part of the total range of each taxon. Under these circumstances there seems to be no reason

why *astragalina* and *hirsuta* should not be recognised as distinct species, which may be differentiated as follows:—

Longer peduncles nearly always over 25 mm. long; pod usually 6–9-seeded, c. 2 mm. wide, some, or all, of the hairs on its dorsal surface usually brown; largest number of leaflets on any one leaf usually 7, less often 9 . . . . . *hirsuta*

Longest peduncle under 25 mm. long; pod usually 4–6-seeded, c. 3 mm. wide, the hairs on its dorsal surface usually white; largest number of leaflets on any one leaf usually 9 or 11, occasionally 7 . . *astragalina*

Four questions remain to be answered.

(1) What are the 'intermediate' specimens from Angola etc.?
(2) What are the anomalous plants in Australia?
(3) Why have *astragalina* and *hirsuta* been so often confused?
(4) Why has Dr. Ali come to the opposite conclusion to that reached here?

(1) The intermediates from Angola, Northern Rhodesia and adjacent parts of South West Africa, unlike those from West Africa and the Sudan, include well grown plants, complete with mature fruit such as *Rogers* 8067, *Welwitsch* 2054, *Gossweiler* 1384. *Antunes & Dekindt* 3141 and *de Winter & Marais* 4706. While their characters are such that they might have arisen by crossing between *hirsuta* and *astragalina*, both of which occur in the region, it is difficult to see why, if this be the explanation, there is not more evidence for crossing in other areas where these two species co-exist. It is worth noticing that this region is the centre of greatest diversity (probable centre of origin) of §§ *Hirsutae*; besides the two taxa here treated, *I. hirsuta* var. *aemula* and *I. longebarbata* at its most variable occur here; the 'intermediates' may be connected with these taxa rather than with *I. astragalina*.

(2) No true *astragalina* has been seen from Australia and it seems therefore unlikely that *Perry* 1649, & 2029 can be the result of hybridisation, though they do combine characters of *hirsuta* and *astragalina*. It is worth remarking that in Australia *hirsuta* includes a higher proportion of plants with 4 pairs of leaflets than usual and also that a sort of cline of increasing frequency of white-haired pods is observable in *hirsuta* as we pass from Africa through India and SE. Asia to Australia.

(3) A glance at Tables 4, 5 and 7 shows why confusion between *astragalina* and *hirsuta* has arisen in the past. The West African and Sudanese representatives of *astragalina*, including its type, form an extreme race in which 2–4-seeded, uniformly white-haired, pods, under 14 mm. long prevail. Botanists have tended to consider these characters as essential for *astragalina* and thus specimens of that species from other areas with longer, brown-haired pods have been misidentified as *hirsuta* and the distinction between the two species lost sight of. Once the true characters of *astragalina* are grasped it is even more completely separable from *hirsuta* in India, where the two species have almost always been confused, than it is in Africa.

(4) The reasons for Dr. Ali's failure to grasp this difference are apparent in his thesis. In the first place he completely neglects the breadth of the pod, which is one of the two most important criteria. Secondly his

methods of dealing with the four criteria which he does investigate are faulty. Instead of first tabulating the total variation of each character and then letting such differences as may exist appear from the facts, he divides his material into two groups only for each character choosing the point of division arbitrarily. Two of these dividing points, hairs on pod uniformly white versus hairs on pod not uniformly white and seeds 1–6 versus 7–11 happen to be reasonable but the other two, peduncle over 50 mm. versus peduncle under 50 mm. and leaflets 3–5 versus 7–11 are not those which would have emerged from the proper study of the material and merely confuse the issue. Dr. Ali adopts these 2 correct and 2 incorrect criteria in a few lines giving no reason at all for choosing the particular points of division that he adopts. Subsequently he devotes no fewer than 22 pages to tabulating his measurements, calculations of probability based upon them and a discussion of his results. But all this vast edifice is worthless when it is based on erroneous assumptions.

The geographical areas of *I. astragalina* and *I. hirsuta* in the Old World are shown in Map 1, p. 298: both species occur also in the New World, probably as weeds of cultivation. It will be seen that the two distributions are clearly different, although there is a certain amount of overlapping. Where both species occur in one region *hirsuta* occupies the wetter, *astragalina* the drier areas. This map conflicts with Dr. Ali's statement that there is no correlation between geographical distribution and the characters used to separate *hirsuta* from *astragalina*: it appears that he has often localised his specimens simply to their countries, failing to notice, for instance, that although both *hirsuta* and *astragalina* occur in Nigeria, Tanganyika and Portuguese East Africa, they occur in different parts of these countries. All specimens seen from the NW. Himalayas, which include most of those cited by Dr. Ali, are *astragalina*.

Clasterosporium and some allied genera.*—This is a continuation of the author's earlier studies reported in Mycological Paper No. 70, which dealt with *Clasterosporium*, *Ceratophorum*, *Sporidesmium* and *Annellophora*. The present paper describes two new species each for *Clasterosporium* and *Sporidesmium* and deals fully with the further genera *Bactrodesmium* (9 species), *Brachysporiella* (3 species), *Endophragmia* (11 species), *Stigmina* (30 species) and a new monotypic genus *Bactrodesmiella*. The taxonomy is modern, the diagnoses impeccable, the figures ample and executed with that meticulous care shown in the author's earlier work. Twenty species are described as new and the types of nineteen of these are said to be deposited in the herbarium of the Commonwealth Mycological Institute, a public repudiation of a public undertaking not to retain types given when the Institute was founded. Plant pathologists should note that several pathogens have been transferred to *Stigmina*, notably the well known *Clasterosporium carpophilum* (Lév.) Aderhold.

R. W. G. Dennis

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* *Clasterosporium and some allied Dematiaceae-Phragmosporae. II.* Mycological Papers No. 72. By M. B. Ellis. Pp. 75. Kew: Commonwealth Mycological Institute, 1959. Price £1. 5. 0.

Epilobium pedunculare A. Cunn. and its allies

R. Melville

An enquiry about the name of a New Zealand *Epilobium*, which has become naturalised in several places in the British Isles, drew my attention to the plant which hitherto has been called *E. pedunculare* A. Cunn. The original description was published by Cunningham, with those of other species, in his 'Precursor' (Ann. Nat. Hist. **3**, 31: 1839) and reads as follows:—

'536. *E. pedunculare*, repens, radicans, parum pubescens, foliis oppositis subrotundis (2 lineas longis) membranaceis petiolatis denticulatis, floribus axillaribus solitariis, pedunculis elongatis, fructibus glabris.

New Zealand (Northern Island). Near the lake situated between Waimaté Mission House and the great forest of Hokianga.—1834, Rich. Cunningham.'

Richard Cunningham's specimen of this plant is preserved at Kew: it was in Allan Cunningham's personal herbarium which was presented to Kew by Robert Heward in 1862. The original label bears the number 146 and the words 'between Waimaté and the Great Forest of Hokianga past the Lake' in Richard Cunningham's hand. Above this Allan Cunningham has written 'No. 536 Epilobium—A. Cunn. Ann. Nat. Hist. V. III p. 31' and at the side 'New Zealand R. Cunningham 1834'. The epithet '*pedunculare*' was inserted in the space after '*Epilobium*' by another and shaky hand. The sheet also bears a second label which clearly does not belong to it. This smaller label has on it the words 'Head of the Kana Kana. 132' in Richard Cunningham's hand. By reference to the other species described by Cunningham in the 'Precursor' it is evident that the second label can refer only to *E. virgatum* A. Cunn., a plant with a very different habit from that under review. There is no reason to doubt, therefore, that this specimen is the holotype of Allan Cunningham's description.

The sheet bears sixteen stems or fragments of stems and careful inspection shows that these all belong to one species. There is no admixture. It was important to establish this point because Haussknecht selected one of the infertile stems on this sheet as the type of his *E. caespitosum* (Haussk., Monogr. 301, t. 30, fig. 85: 1884). Although he did not describe flowers, capsules or seeds, nevertheless an almost full size flower bud was drawn in his figure. It is remarkable that any monographer should have the temerity to describe a new species in this critical genus from an imperfect fragment. On his own showing, it is very close indeed to *E. linnaeoïdes* Hook. f. and, in fact, differs from average specimens of that species only in possessing smaller leaves. Detailed comparison of all of the specimens on the type sheet with the holotype of *E. linnaeoïdes* Hook. f. (Fl. Antarc. **1**, 10, t. 6: 1844) has convinced me that the latter is conspecific with *E. pedunculare* A. Cunn. Although Cunningham's specimens are smaller than average, they differ in no significant way from *E. linnaeoïdes*. All the leaves possess the characteristic margin with regularly arranged acutely dentate teeth. The name *E. pedunculare* A. Cunn. must, therefore, be applied to the species that hitherto has been known as *E. linnaeoïdes* Hook. f. In passing, it may be pointed out that

Haussknecht when citing the source of his *E. caespitosum* wrongly combined the localities from the two labels on the type sheet, thus adding further to the confusion.

The initial mistake in this chapter of errors was the failure of J. D. Hooker to recognise that his *E. linnaeoïdes* was conspecific with *E. pedunculare* A. Cunn. He then misidentified *E. pedunculare* A. Cunn. with a common

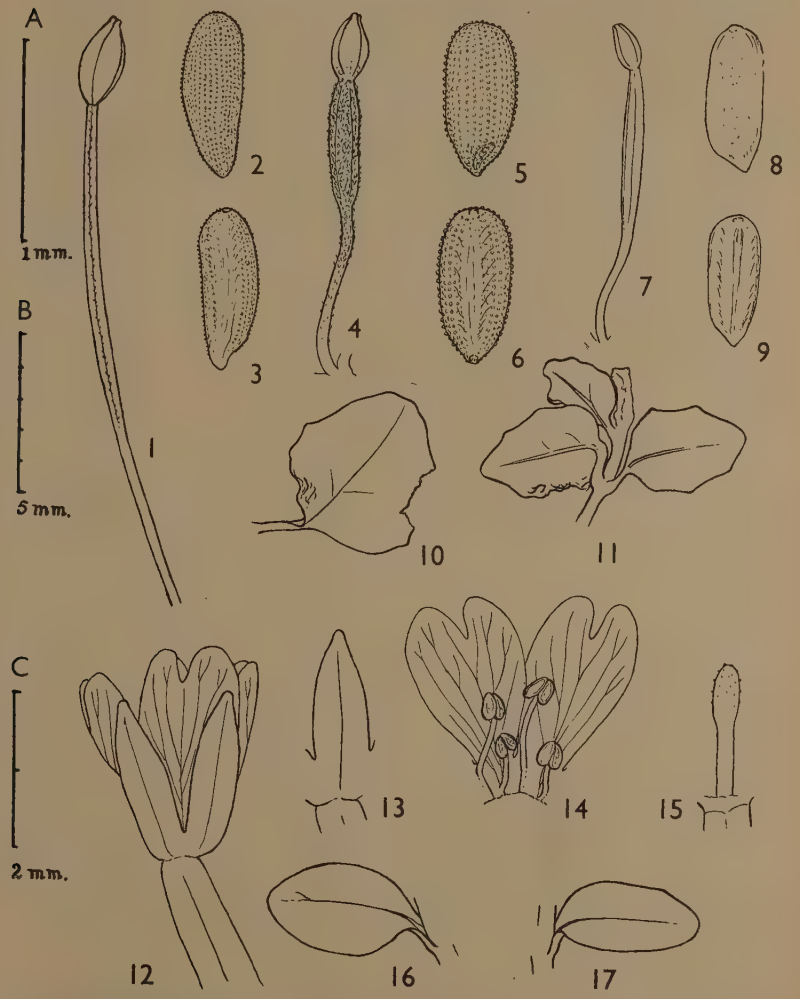

FIG. 1. *Epilobium nerterioïdes* A. Cunn.: 1 ovary and mature flower bud; 2, 3 seeds, from W. B. Brockie No. 97190; 10, 11 leaves from the Kew isotype. *E. nummulariifolium* R. Cunn. ex A. Cunn.: 4, ovary and mature flower bud; 5, 6, seeds, from W. B. Brockie, No. 97192. *E. inornatum* Melville: 7, ovary and mature flower bud; 8, 9, seeds; 12, flower; 13, sepal; 14, two petals and four stamens; 15 styles and stigma; 16, 17, leaves, all from the holotype. Scales: **A**, 2, 3, 5, 6, 8, 9; **B**, 1, 4, 7, 10, 11, 16, 17; **C**, 12–15.

New Zealand plant, which he regarded as a variety of *E. nummulariifolium* R. Cunn. ex A. Cunn. (Fl. Nov.-Zel. **1**, 58: 1852)—var. *pedunculare*. Hooker also placed *E. nerterioïdes* A. Cunn. as a variety of the same species. Haussknecht in his monograph recognised *E. nummulariifolium* var. *pedunculare* Hook. f. as a distinct species for which he adopted the epithet '*pedunculare*' retaining *E. nerterioïdes* A. Cunn. with it as f. *aprica*. Later writers, among them Cheeseman (Man. N.Z. Fl., ed. 2, 611: 1925), have considered the plant known at present as *E. nerterioïdes* A. Cunn. specifically distinct from *E. pedunculare* sensu Haussknecht. Material in Herb. Kew. identified as *E. nerterioïdes* was insufficient to settle this critical point with certainty and I am indebted to Dr. E. J. Godley and Miss L. B. Moore of the Botany Division, D.S.I.R., New Zealand and to Mr. W. B. Brockie, of the Otari Open-air Native Plant Museum at Wellington for observations on the status of these plants in New Zealand. I have also to thank Miss Moore and Mr. Brockie for representative specimens of plants cultivated in the Otari garden from native stations. From the information supplied, it is clear that there are two plants which behave as distinct species, both in the field and in the breeding experiments carried out by Mr. Brockie. It remains now to decide to which species the name *E. nerterioïdes* A. Cunn. should be applied and to supply a name for the other.

Three fragments of Allan Cunningham's material of *E. nerterioïdes* are preserved at Kew. They formed part of his personal herbarium, which was presented to Kew by Robert Heward. When, at the start of this investigation, the collections in the Herbarium of the British Museum were consulted, a much better and more complete specimen was seen bearing Allan Cunningham's original field label. It was evident that this specimen should be regarded as the holotype and the attention of the Museum staff was drawn to this fact. The sheet was put aside with the intention of placing it in a type cover and making a minor repair. Later, when it was desired to make detailed notes and comparisons, the sheet could not be found and now, after the lapse of more than a year, it is still mislaid. At present, the only specimen available on which to base a decision is the Kew isotype. This has only the lower part of an ovary, which appears to be glabrous and was borne on a glabrous peduncle about 6 mm. long. The stems are glabrous or sparingly bifariously puberulent. The leaves (Fig. 1/10 & 11) are thin in texture and ovate to suborbicular, or sometimes elliptic and frequently are obscurely dentate. The lamina is up to 5 mm. long and the petioles 1–2 mm. long. This assemblage of characters agrees most closely with the plant that has been called '*E. pedunculare* var. *viride*' in New Zealand, as exemplified by W. B. Brockie No. 97191 from South Makara Stream, Wellington, grown on at Otari Open-air Native Plant Museum, except that the leaves are smaller. The name *E. nerterioïdes* A. Cunn. therefore belongs to the species that hitherto has generally been called '*E. pedunculare*', i.e. *E. pedunculare* Hausskn., non A. Cunn. A description of the nameless species follows:

Epilobium inornatum *Melville*, sp. nov., *E. nummulariifolio* R. Cunn. ex A. Cunn. et *E. nerterioïdei* A. Cunn. affine sed a priore capsulis subglabris et ab altero capsulis minoribus et seminibus epapillatis differt.

Herba prostrata; caules virides vel purpurascentes, 3–15 cm. longi, glabri vel lateribus oppositis ± puberulis. *Folia* opposita, saepe congesta; laminae

ellipticae vel ovatae vel suborbiculatae, 2–7 mm. longae, glabrae, marginibus integris, subtus in siccis ± areolato-rugosae, ad petiolos breves 0·5–1·0 mm. vel rare ad 2·0 mm. longos affixae. *Flores* singuli in axillis foliorum, erecti; sepali 4 lanceolati vel oblongo-lanceolati, circa 2 mm. longi, glabri; petali 4, obovati, emarginati, circa 2·5 mm. longi, albidi vel pallide-rosei; stamina 8, basi corollae adnata, 4 antisepala ad ½ et 4 antipetala at ¼ longitudinis petalorum attingentia; stigmata clavata; ovaria linearia 4–7 mm. longa, pedunculis 4–22 mm. longis praedita. *Capsulae* lineariae, erectae, 12–26 mm. longae, pedunculis 5–50 mm. longis, glabrae vel in sulcis pilis brevibus sparse ornatae. *Semina* oblonga vel obovato-oblonga, circa 0·7 mm. longa, superficies glabrae obscure-reticulatae inornatae.

Holotype: Lake Tekapo, grown on at Otari Open-air Native Plant Museum, Wellington, New Zealand, 29 Jan. 1958, *W. B. Brockie* No. 97189 in Herb. Kew.; Isotype in Herb. Div. Bot. D.S.I.R., Nov. Zeel.

var. **inornatum**, capsulae 17–20–26 mm. longae, pedunculis 25–35–50 mm. longis praeditae.

var. **brevipes** (*Hook. f.*) *Melville*, comb. nov., capsulae 12–20 mm. longae, pedunculis 5–15 mm. longis praeditae.

Lectotypus: Colenso No. 3810, Nov. Zeel. in Herb. Kew.

Synonyms: *E. nummulariifolium* R. Cunn. ex A. Cunn. var. *brevipes* Hook. f., Fl. Nov. Zeel. **1**, 58 (1852); *E. pedunculare* Hausskn. non A. Cunn. var. *minimum* Kirk, Stud. Fl. N.Z. 174 (1899): *E. neterioïdes* A. Cunn. var. *minimum* (Kirk) Cockayne in Bot. Surv. Stewart I. 43 (1909).

The following essential synonymy of the species under review summarises the present position.

E. pedunculare *A. Cunn.* in Ann. Nat. Hist. **3**, 31 (1839)

E. linnaeoïdes Hook. f., Fl. Antarct. **1**, 10, t. 6 (1844)
E. caespitosum Hausskn., Monogr. 301, t. 20, fig. 85 (1884)

E. nerterioïdes *A. Cunn.* in Ann. Nat. Hist. **3**, 32 (1839)

E. nummulariifolium R. Cunn. ex A. Cunn. var. *pedunculare* Hook. f., Fl. Nov. Zeel. **1**, 58 (1852)

[*E. pedunculare* sensu Hausskn., Monogr. 302, t. 23, fig. 96 (1884) excl. f. *aprica* Hausskn.; Kirk, Stud. Fl. N.Z. 173 (1899); Cheeseman, Man. N.Z. Fl. 180 (1906); non A. Cunn.]

E. inornatum *Melville*

[*E. nerterioïdes* sensu Hook. f., Fl. Antarct. **1**, 11 (1844); Kirk, Stud. Fl. N.Z. 174 (1899); Cheeseman, Man. N.Z. Fl. 180 (1906); non A. Cunn.]
E. nummulariifolium R. Cunn. ex A. Cunn. var. *nerteroïdes* Hook. f., Fl. Nov. Zeel. **1**, 58 (1852)
E. pedunculare sensu Hausskn., non A. Cunn. forma *aprica* Hausskn., Monogr. 303 (1884)

Of the three species, *E. pedunculare* A. Cunn. is recognisable without difficulty by the regularly dentate leaves with acute teeth. *E. nummulariifolium*

R. Cunn. ex A. Cunn. is more likely to be confused with the other two. Its most distinctive character is the dense white puberulence which covers the ovary and capsules, but it has, on the whole, slightly larger and more rounded leaves than *E. nerterioïdes* and they are also more regularly, though distantly and shallowly dentate. The seeds are about the same size but the papillae which cover them are slightly larger and less numerous than in *E. nerterioïdes* A. Cunn. The latter, characteristically, has very elongated capsules and peduncles and the capsules are glabrous, or nearly so, except for the row of short hairs along the sutures. The papillae on the seeds are slightly smaller and more numerous than those of *E. nummulariifolium* and the leaves are more frequently ovate or elliptic ovate; they tend to have fewer, very shallow, blunt teeth. The leaves of *E. inornatum* are commonly elliptic, but in extreme forms they may be very small—2 mm. long—suborbicular and thick in texture, with the margins recurved and in dry material the lower surface is depressed between the main branches of the vascular system. This rugosity of the lower surface of the leaf is generally more or less evident. The leaf margin is commonly entire, though a single very shallow tooth may disturb its outline (Fig. 1/17). The capsules are glabrous or very nearly so; sometimes there are a few small hairs along the sutures. The seeds are smaller than in either *E. nummulariifolium* or *E. nerterioïdes* and they are at once distinguishable under a lens by their smooth surfaces, which lack the papillae of the other two species and are marked only by obscure areolations.

Flowering trees of Venezuela.*—The Shell Company has published this beautiful album of coloured plates of 23 characteristically showy flowering trees of Venezuela. They are preceded by a short introduction by Antonio Aparicio, and a botanical appendix (with figures, descriptions and notes on distribution and uses) by Prof. Francisco Tamayo gives a quasi-scientific cachet to this lavish production. Botanists may profit by seeing in such lovely pictures the habit and shape of these trees in their natural surroundings, often against a background of distant mountains or savannas which look extraordinarily arid and eroded. But Venezuela is by no means all like this. The impression of drought is increased by the deciduous nature of so many of these trees covered with gorgeous, densely massed blossoms along the bare boughs. The National Tree of Venezuela is one of them, namely, the Araguaney, *Tabebuia chrysantha*. Two other *Bignoniaceae* are given Latin names that will not pass muster: Apamate is *Tabebuia rosea* (Bertol.) Sandw., not *T. pentaphylla* (L.) Hemsl., and Araguan is *Cybistax chrysea* (Blake) Seibert, not *Tabebuia chrysea* Blake. Several other species are given only generic names.

What is the purpose of these sumptuous floral albums, one wonders? Is it pleasure or propaganda, or a bit of both, or are they merely a sign of the times of affluence? The text throughout is in Spanish.

N. Y. Sandwith

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* *Arboles en flor de Venezuela*. Pp. 66 + viii, 23 plates, photographs. Compañia Shell de Venezuela, 1959. Price unknown.

Notes on African *Sapotaceae*: I

H. Heine

The following notes have resulted from my revision of *Sapotaceae* for the second edition of the 'Flora of West Tropical Africa'.

Neolemonniera Heine

Neolemonniera *Heine*, nom. nov.

Le Monniera H. Lecomte in Not. Syst. **3**, 337 (1918), non *Lemonniera* De Wild. in Ann. Soc. Belg. Micr. **18**, 143 (1894) (*Mucedinaceae*, *Sphaeropsideae*)

Neolemonniera clitandrifolia (*A. Chev.*) *Heine*, comb. nov.

Mimusops clitandrifolia A. Chev. in Végét. Ut. Afr. Trop. Franç. **5**, 242 (1909); A. Chev. in Expl. Bot. Afr. Occ. Fr. **1**, 392 (1920) [errore 'clitandrifolium']; A. Chev. in Rev. Bot. Appliq. **23**, 134 (1943)
Sideroxylon aylmeri M. B. Scott in Kew Bull. **1915**, 45 (1915); Hutch. & Dalz., Fl. W. Trop. Afr. **2**, 12 (1931)
Le Monniera clitandrifolia (A. Chev.) H. Lecomte, *l.c.* 342 (1918); Aubréville, Fl. For. C. Ivoire **3**, 96, t. 278 (1936) & ed. 2, **3**, 116, t. 292 (1959)
Pouteria aylmeri (M. B. Scott) Baehni in Candollea **9**, 322 (1942)

Neolemonniera ogouensis (*Pierre ex Dubard*) *Heine*, comb. nov.

Lecomteodoxa ogouensis Pierre ex Dubard in Not. Syst. **3**, 46 (1914)
Le Monniera ogouensis (Pierre ex Dubard) H. Lecomte, *l.c.* 339 (1918)

Neolemonniera batesii (*Engl.*) *Heine*, comb. nov.

Mimusops batesii Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**, 64, t. 24, fig B. (1904)
Le Monniera batesii (Engl.) H. Lecomte, *l.c.* 343 (1918)

*Aubregrinia** Heine

Aubregrinia *Heine*, nom. nov.

Endotricha Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **81**, 794 (1935), non *Endotrichia* Suringar, Algae Jap. Mus. Bot. Lugd-Bat. 34 (1870) (*Endocladiaceae*, *Florideae*)

Aubregrinia taïensis (*Aubrév. & Pellegr.*) *Heine*, comb. nov.

Endotricha taïensis Aubrév. & Pellegr., *l.c.* 795 (1935); Aubrév., Fl. For. C. Ivoire **3**, 110 [errore 'Entotricha'], t. 283, fig. 1–3 (1936) & ed. 2, **3**, 132, t. 298 (1959); Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **104**, 277 (1957)

Although undoubtedly closely allied to the genus *Chrysophyllum* Linn., our present incomplete knowledge does not permit the inclusion in it of this monotypical genus, as only the female plant is known.

* From *Aubré*ville and Pelle*grin*, in commemoration of the excellent co-operationof these famous French botanists in elucidating the taxonomy of African *Sapotaceae*.

BREVIEA AUBRÉV. & PELLEGR.

Breviea *Aubrév. & Pellegr.* in Bull. Soc. Bot. Fr. 81: 388 (1935)

B. leptosperma (*Baehni*) *Heine*, comb. nov.

Chrysophyllum sericeum A. Chev. in Bull. Soc. Bot. Fr., Mém. **8**, 296 (1917); A. Chev., Expl. Bot. Afr. Occ. Fr. **1**, 386; Hutch. & Dalz., Fl. W. Trop. Afr. **2**, 9 (1931); Hutch. & Dalz. in Kew Bull. **1937**, 55 (1937); non Salisb., Prodr. 138 (1796) nec A. DC., Prodr. **8**, 758 (1844)
Breviea sericea (A. Chev.) Aubrév. & Pellegr., *l.c.* 793, fig. 1, p. 799 (1935); Aubrév., Fl. For. C. Ivoire **3**, 108, t. 282 (1936); ed. 2, **3**, 130, t. 297 (1959); A. Chev. in Rev. Bot. Appliq. **23**, 284 (1943)
Pouteria leptosperma Baehni in Candollea **9**, 388 (1943)
Chrysophyllum leptospermum (Baehni) Roberty in Bull. I.F.A.N. **15**, 1417 (1953)

There are very good reasons for keeping this remarkable species in a separate genus, which was originally done by Aubréville & Pellegrin, *l.c.* (1935). The genus has much more affinity with *Chrysophyllum* L. than with *Pouteria* Aubl. emend. Baehni.

VINCENTELLA PIERRE

Vincentella revoluta (*Bak.*) *Pierre*, Not. Bot. Sapot. 37 (1891); Aubrév., Fl. For. Soud.-Guin. 427; A. Chev. in Rev. Bot. Appliq. **23**, 284 (1943); Roberty, Petite Fl. Ouest-Afr. 79 (1954)

Sideroxylon revolutum Bak. in Fl. Trop. Afr. **3**, 503 (1877)
Sideroxylon densiflorum Bak., *l.c.*; Henriques in Bol. Soc. Brot. **10**, 139 (1893) & *l.c.*, **27**, 193 (1917); pro parte
Vincentella densiflora (Bak.) Pierre, Not. Bot. Sapot. 37 (1891); Exell, Cat. Vasc. Pl. S. Tomé 235 (1944)
Bakerisideroxylon revolutum (Bak.) Engl., Monogr. Afr. Pfl.-fam. u. -Gatt. **8**, 23, t. 11 (1904), incl. var. *brevipetiolulatum* Engl., *l.c.*; A. Chev., Expl. Bot. Afr. Occ. Fr. **1**, 390 (1920); Hutch. & Dalz., Fl. W. Trop. Afr. **2**, 12 (1931)
Bakerisideroxylon densiflorum (Bak.) Engl., *l.c.* 34 (1904)
Bakeriella revoluta (Bak.) Dubard in Ann. Mus. Col. Marseille, sér. 2, **10**, 28 (1912)
Bakeriella densiflora Dubard, *l.c.*
Vincentella impressa Sprague ex Chipp, Gold Coast Trees and Shrubs 26 (1913), *nomen nudum*
Bakerisideroxylon bruneelii De Wild. in Fedde, Rep. **13**, 375 (1914)
Vincentella camerounensis Pierre ex Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **81**, 800 (1935); Aubrév. & Pellegr. in Fl. For. C. Ivoire **3**, 108 (1936) & ed. 2, **3**, 130, t. 306, fig. 5–9 (1959); A. Chev. in Rev. Bot. Appliq. **23**, 284 (1943); Aubrév. in Fl. For. Soud.-Guin. 427 (1950)
Pouteria revoluta (Bak.) Baehni in Candollea **9**, 385 (1942)
Pouteria densiflora (Bak.) Baehni, *l.c.* 387 (1942)

Pouteria camerounensis (Pierre ex Aubrév. & Pellegr.) Baehni, *l.c.* 383 (1942)

The specific distinction between *Sideroxylon revolutum* and *S. densiflorum* (Fl. Trop. Afr. **3**, 503: 1877) is based only on vegetative characters (size of leaves) and a wrongly stated absence of stipules in *S. densiflorum*. There is an overlooked note by Pierre attached to the type specimen of *S. revolutum* Bak. in the Kew Herbarium: 'Les S. revolutum et densiflorum sont évidemment 2 formes de la même espèce. 9/83—Pierre.' According to Exell (*l.c.*) *S. densiflora* has never, with certainty, been collected again since Mann's original specimens. In addition *Vincentella camerounensis* is based also only on minute characters (very slightly smaller flowers and a more hirsute inferior half of the style), so that it seems best to apply to all these very variable and often misidentified plants the name *Vincentella revoluta* (Bak.) Pierre.

A new species of Sphaerophragmium from Tanganyika.—The following apparently undescribed rust is extremely abundant on pods of a species of *Parkia* recently received at Kew from Tanganyika Territory: *Sphaerophragmium parkiae* Dennis, sp. nov.

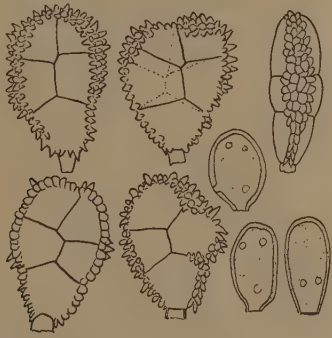

Fig. 1. Teleutospores and uredospores of *Sphaerophragmium parkiae*, × 660

Soris uredosporiferis amphigenis, dense aggregatis, subcuticularibus, castaneis, ½–1 mm. diametris; uredosporis ellipsoideis vel ovatis, punctatis, pallide brunneolis, 20–29 × 13–18μ, episporio 2μ crasso, poris germinationis pluribus instructis; teleutosporis lateraliter applanatis, ambitu ellipsoideis vel clavatis, ex cellulis 3–5 compositis, dilute brunneis, margine verrucis hyalinis conicis vel truncatis usque 4μ longis obsitis, 34–45 × 29–35 × 16μ. Hab. in fructibus *?Parkiis filicoideae*, 1350 m., Mtowanguuwe, Lushoto Distr., Tanga Prov., Tanganyika Territory, Oct. 1958, *C. D. Mgaza* 177A, typus.

The teleutospores arise within the uredosori and there seem to be no paraphyses. Such hyaline clavate structures as occur have the same shape and finely punctate wall as the uredospores and are probably to be interpreted as immature stages of the latter.

R. W. G. Dennis

Notes on African *Sapotaceae*: II

THE GENUS BEQUAERTIODENDRON DE WILD.

H. Heine & J. H. Hemsley

In course of study of the genus *Chrysophyllum* L. for the 'Flora of West Tropical Africa' and the 'Flora of Tropical East Africa' several taxa including well-known and widely distributed species, e.g. *C. magalismontanum* Sond., *C. natalense* Sond. and *C. glomeruliferum* Hutch. & Dalz., have been observed to have anomalous fruit-characters and to stand apart from the main body of the genus.

A series of type-specimens which formed the basis of a number of De Wildeman's species from the Belgian Congo, kindly loaned by Prof. W. Robyns from the Herbarium of the Jardin Botanique de l'État, Bruxelles, have been found to be closely related to the *C. magalismontanum* complex. They are clearly to be regarded as congeneric.

Fruits of *Chrysophyllum* species are, in the main, fleshy but firm-walled berries, containing one to five or more polished, flattened, bean-like seeds. The embryo has thin leaf-like cotyledons embedded in a copious endosperm. Cronquist (in Bull. Torrey Bot. Club **72**, 191: 1945 and **73**, 288: 1946) has published studies of the genus *Chrysophyllum* of both North and South America and is in concordance with a long sequence of previous authors in describing the embryo with thin cotyledons and well developed caudicle, embedded in copious endosperm. This is regarded as an important diagnosis because the author covers the whole genus in the new world, an area including the type species. The characters apply equally well in the case of African species, except in those species given above where the seed contains two large fleshy plano-convex cotyledons and endosperm is lacking.

The anomalous position of the species *C. natalense* and *C. magalismontanum* was recognized by Pierre who, in a paginated document intended to be the third part of the important 'Notes Botaniques Sapotacées' but never published, proposed two new genera, *Boivinella* [a name which has been later changed; the authors, Aubréville & Pellegrin in Bull. Soc. Bot. Fr. **106**, 23: 1959, having previously accepted it as a generic name (Bull. Soc. Bot. Fr. **105**, 37: 1958), rightly recognized the earlier use as a genus of *Gramineae*] and *Zeyherella*. The latter name, although used by Engler at sectional level, has never been used generically until Aubréville & Pellegrin, in Bull. Soc. Bot. Fr., **105**, 37 (1958), used it to accommodate the species *Chrysophyllum magalismontanum*.

As mentioned earlier, a series of taxa from the Congo, described by De Wildeman, bear close affinity with *C. magalismontanum*, and are considered conspecific by the present authors. Examination of the Brussels type material of *C. longepedicellatum* De Wild., *C. longifolium* De Wild., *C. lujai* De Wild. *C. sapinii* De Wild. and of *C. vermoesenii* De Wild. has shown it impossible to maintain the specific distinctions claimed by the original author. To these species may be added *C. laurentii* De Wild., *C. iturense* Engl., *C. farannense* A. Chev., and *Tisserantiodoxa oubanguiensis* Aubrév. & Pellegr. An extensive series of material from South Africa, the Rhodesias and East Africa has

already proved it impossible to maintain a strict concept of the species *C. magalismontanum* Sond., based within the narrow limits of distribution in South Africa. The type-material and other gatherings from dry open slopes and gullies of the Magaliesberg range are concluded to be habitat adaptations, the vegetative parts, e.g. leaf characters falling within the lower extremes of size and leaf-shape variation.

The need for recognition of the group of which *C. magalismontanum* is a typical representative has been apparent to previous workers in the family. Engler, in Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**, 46 (1904), used the earlier manuscript name *Zeyherella* of Pierre as a section of *Chrysophyllum*, including four species, namely *C. argyrophyllum* Hiern, *C. wilmsii* Engl. *C. magalismontum* Sond., and *C. carvalhoi* Engl. Following study by the present authors these taxa are all considered to be reducible to a single species. Engler's treatment was based upon few specimens; *C. wilmsii* and *C. carvalhoi* on single gatherings only. Aubréville & Pellegrin (in Bull. Soc. Bot. Fr., **105**, 37: 1958) split this section into two, viz., *Zeyherella* and *Boivinella*, both proposed as new genera. Into the former was placed *Z. magalismontana*, and the latter incorporated five species: *Boivinella natalensis* (Sond.) Pierre ex Aubrév. & Pellegr., *B. glomerulifera* (Hutch. & Dalz.) Aubrév. & Pellegr., *B. wilmsii* (Engl.) Aubrév. & Pellegr., *B. argyrophylla* (Hiern) Aubrév. & Pellegr., *B. kilimandscharica* (G. M. Schulze) Aubrév. & Pellegr. In the year preceding this publication, Aubréville & Pellegrin had created a new monotypic genus, *Tisserantiodoxa* (in Bull. Soc. Bot. Fr. **104**, 277: 1957), with the species *T. oubanguiensis* Aubrév. & Pellegr., based upon a series of West African specimens, (Ubangi, Cameroons and S. Nigeria). Of the specimens cited, iso-paratypes of *Bates* 1776, *Kennedy* 2313, are available in the Kew Herbarium. In the discussion the new genus is reported to differ from *Chrysophyllum* in characters of flower-structure, mainly concerning the stamens. Short filaments are united and thickened at the base forming a narrow collar-like ring at the upper end of the corolla-tube. The fruit is single-seeded, and the seed has a large scar covering the entire ventral surface. The genus is said to have some affinity with *Chrysophyllum*, in particular *C. longipedicellatum* De Wild. Both iso-syntype specimens cited above are conspecific with material cited in Fl. W. Trop. Afr. **2**, 10 (1931), under *C. laurentii* De Wild., *C. farannense* A. Chev. and *C. sapinii* De Wild. are given here as synonyms.

The most recent publication concerning African *Sapotaceae*, A. D. J. Meeuse, 'Notes on the Sapotaceae of South Africa' (in Bothalia **7**, 317–379: 1960), puts Engler's section *Zeyherella* of *Chrysophyllum* into *Pouteria* Aubl. in the sense newly circumscribed by the author, giving the following new combinations: *Pouteria magalismontana* (Sond.) A. Meeuse (p. 335) and *P. natalensis* (Sond.) A. Meeuse, (p. 339), and of several other taxa not belonging to the section *Zeyherella*. The present writers remain unconvinced that the acceptance of *Pouteria* Aubl. emend. Baehni, or in the sense of Meeuse, results in any advance towards a consistent taxonomic treatment for the continent of Africa as a whole.

New combinations given by Lecomte (in Bull. Mus. Hist. Nat. Paris **25**, 192: 1919) for *C. magalismontanum* under the generic name *Pachystela* Pierre ex Engl. namely *P. magalismontana* (Sond.) Lecomte, and by J. Léonard (in Compt. Rend. Sem. Agric. Yangambi, communic. 67, 873: 1947) for

Chrysophyllum longepedicellatum De Wild. again under *Pachystela*, namely *P. longepedicellata* (De Wild.) J. Léonard, show clearly that these authors had concluded, in agreement with Meeuse's intention, that there was need to transfer certain species from the genus *Chrysophyllum* (*Pouteria* Aubl. sensu Meeuse includes *Pachystela* Pierre ex Engl.).

In dealing with the problem more recent authors have not accounted for a genus established in 1919 by De Wildeman (in Rev. Zool. Afr. **7**, Suppl. Bot. 22: 1919). This genus, *Bequaertiodendron*, was based upon a specimen collected in the Belgian Congo, Ituri River, *Bequaert* 2483, which also has been kindly loaned by Prof. W. Robyns. This plant is undoubtedly conspecific with the specimens used for the description of *Tisserantiodoxa* by Aubréville & Pellegrin in 1957 and further studies have led the present writers to the conclusion that we are dealing with a series of ecological and, in some cases, a gradient of sexual forms. De Wildeman himself stated that his newly established genus (Pl. Bequaert. **4**, 124: 1926), bears great similarity with *Chrysophyllum iturense* Engl. The latter species is considered to be part of the wider *C. magalismontum* complex.

It has become apparent during the course of study that very great ecological adaptation is to be found covering many parts of the African continent. Arising from researches which have covered only small parts of the continent there is now a wealth of names, and with the material at present available it has proved quite impossible to distinguish clear-cut specific boundaries. *Chrysophyllum magalismontanum* must be considered to be conspecific with type-species of the genus *Bequaertiodendron* De Wild. emend. Heine & J. H. Hemsley, which is the oldest name of generic rank available for members of the group.

Plants described from Southern Cameroons (Nkolebunde, *Ledermann* 909, Eduduma-Bidue, *Mildbraed* 6113) by K. Krause as *Englerophytum stelechantha* Krause (Engl., Bot. Jahrb. **50**, Suppl. 344: 1914) may also belong to this group, but as the whole type-material has been destroyed, as the diagnosis and illustration show aberrant characters, and as the genus was described without fruits, we feel unable to deal with this species in this paper. Even Baehni (in Candollea **7**, 422, 439: 1937) stated that the relationship of *Englerophytum* K. Krause and *Bequaertiodendron* De Wild. had yet to be elucidated, but this cannot be done with certainty, and in conclusion, we emend *Bequaertiodendron* as follows:—

Bequaertiodendron *De Wild. emend. Heine & J. H. Hemsley*

Frutices vel arbores valde variabiles, folia ± petiolata, chartacea vel coriacea, nervis lateralibus primariis numerosis paullum conspicuis fere horizontaliter patentibus, secundariis tenuissimis, densissime parallelis. Flores congesti, fasciculati, raro subsolitarii, pedicellati vel subsessiles, pentameri, hermaphroditi vel unisexuales. Sepala 5 ± libera. Corolla sepala paullum superans. Stamina epipetalia, nunc sessilia vel subsessilia, nunc filamentis brevibus basi nonnumquam breviter monadelphis, in fauce corollae inserta. Staminodia bene evoluta vel absentia. Ovarium nunc conicum nunc subglobosum, dense ferrugineo-tomentosum, 5-loculatum. Stylus brevis, crassus, persistens. Fructus ± ellipsoideus, epicarpio tenue, pericarpio glaberimmo, succulento. Semen late ellipsoideum vel leviter applanatum, testa tenuiter crustacei-cornea, latere ventrali cicatrice lata vel

latissima superficiem seminis pro maiore parte tegente munita. Endospermium non evolutum, cotyledones crassi, plane convexi, radiculo basali.

Species typica : *Bequaertiodendron congolense* De Wild.

Bequaertiodendron De Wild. in Rev. Zool. Afr. **7**, Suppl. Bot. 22 (1919) & Pl. Bequaert. **4**, 143 (1926)
Chrysophyllum L. sect. *Zeyherella* Pierre ex Engl., Monogr., Afr. Pfl.-Fam. u. -Gatt. **8**, 46 (1904)
Pachystela sect. *Zeyherella* (Engl.) Lecomte in Bull. Mus. Hist. Nat. Paris **25**, 193 (1919)
Tisserantiodoxa Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **104**, 277 (1957)
Zeyherella (Engl.) Aubrév. & Pellegr., *l.c.* **105**, 37 (1958)
Boivinella Aubrév. & Pellegr., *l.c.*, (1958), non A. Camus in Bull. Soc. Bot. Fr. **72**, 174 (1925)
Neoboivinella Aubrév. & Pellegr., *l.c.* **105**, 23 (1959)

Bequaertiodendron magalismontanum (*Sond.*) *Heine & J. H. Hemsley*, comb. nov.

Chrysophyllum magalismontanum Sond. in Linnaea **23**, 72 (1850); Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**: 47 & t. 16C (1904); Fl. Pl. S. Africa **3**, t. 98 (1923). Type: South Africa, Magaliesberg, *Zeyher* 1849 (S, holo.; K, iso.!)
C. argyrophyllum Hiern, Cat. Welw. Pl. **3**: 641 (1898); Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**: 46 & t. 16A (1904). Types: Angola, *Welwitsch* 4827 (BM., syn.!, K, isosyn.!), *Welwitsch* 4828 (BM., syn.!, K, isosyn.!), *Welwitsch* 4829 (BM., syn.!)
C. antunesii Engl., Bot. Jahrb. **32**, 137 (1902). Type: Angola, Huilla, *Antunes* 98 (B, holo.†)
C. randii S. Moore in Journ. Bot. **41**, 402 (1903). Type: South Africa, Johannesburg, *Rand* 1017 (BM., holo.!)
C. wilmsii Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**, 46 (1904). Type: South Africa, Lydenburg, *Wilms* 1812 (B, holo. †, K, iso.!, BM., iso.!)
C. carvalhoi Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**, 47 (1904). Type: Portuguese East Africa, Mozambique–Gorungosa, *Carvalho* s.n. (B, holo.† COI, iso.!)
C. mohorense Engl. in Engl., Bot. Jahrb. **38**, 100 (1905); Tang. Terr. Check List 563 (1949). Type: Tanganyika, Mohoro, *Gross in* 'Herb. des Gouvernements' (B, holo.†)
C. longepedicellatum De Wild., Miss. E. Laurent 431, t. 134 (1907). Type: Belgian Congo, Bombimba (Ikelemba), *Laurent* 1160 (BR, holo.)
C. laurentii De Wild., *l.c.*, 429 & t. 133 (1907); F.W.T.A. **2**, 10 (1931). Type: Belgian Congo, Bamania, *Laurent* s.n. (BR, holo.)
C. iturense Engl. in Mildbr., Wiss. Ergebn. Deut. Zentr.-Afr. Exp., 1907–08, **2**, 521, t. 71, fig. A & B (1914). Type: Belgian Congo, Ituri, Irumu-Mawambi, *Mildbraed* 2972 (B, holo.†)
C. longifolium De Wild. in Rev. Zool. Afr. **7**, Suppl. Bot. 19 (1919); Pl. Bequaert. **4**, 132 (1926). Type: Belgian Congo, Ikelemba, *Bonnivair* 46 (BR, holo.!)

† Specimen destroyed

C. sapinii De Wild. in Rev. Zool. Afr. **7**, Suppl. Bot. 19 (1919); Pl. Bequaert. **4**, 139 (1926). Type: Belgian Congo, Bondo, *Sapin* s.n. (BR, holo., K., iso.!)

Bequaertiodendron congolense De Wild. in Rev. Zool. Afr. **7**, Suppl. Bot. 22 (1919); Pl. Bequaert. **4**, 143 (1926). Type: Belgian Congo, Penghe, *Bequaert* 2483 (BR, holo.!)

Pachystela antunesii (Engl.) Lecomte in Bull. Mus. Hist. Nat. Paris **25**, 189 (1919)

P. argyrophylla (Hiern) Lecomte, *l.c.*, 192 (1919)

P. magalismontana (Sond.) Lecomte, *l.c.* (1919)

Chrysophyllum farannense A. Chev., Expl. Bot. Occ. Fr. 386 (1920), *nomen nudum*

C. gossweileri De Wild., Pl. Bequaert. **4**, 130 (1926). Type: Angola, Benguella, *Gossweiler* 2808 (K, iso.!, BM, iso.!)

C. lujae De Wild., *l.c.*, 133 (1926). Type: Portuguese East Africa, Morrumbala, *Luja* 330 (BR, holo.!)

C. vermoesenii De Wild., *l.c.*, 140 (1926). Type: Belgian Congo, Yambata, *Vermoesen* 119 (BR, holo.!)

Pachystela longepedicellata (De Wild.) J. Léonard in Compt. Rend. Sem. Agric. Yangambi, Communic. 67, 873 (1947)

Tisserantiodoxa oubanguiensis Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **104**, 277 (1957); Aubrév., Fl. For. C. Ivoire, ed. 2, **3**, 109, t. 304, fig. 8–15 (1959). Type: Ubangi, *Tisserant* 1866 (P. holo.); Fr. Cameroons, *Bates* 1776 (K, iso-para.!); Nigeria, *Kennedy* 2313 (K, iso-para.!)

Boivinella wilmsii (Engl.) Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **105**, 37 (1958)

B. argyrophylla (Hiern) Aubrév. & Pellegr., *l.c.* (1958)

Zeyherella magalismontana (Sond.) Aubrév. & Pellegr., *l.c.* (1958)

Neoboivinella wilmsii (Engl.) Aubrév. & Pellegr., *l.c.*, **106**, 23 (1959)

Neoboivinella argyrophylla (Hiern) Aubrév. & Pellegr., *l.c.* (1959)

Pouteria magalismontana (Sond.) A. Meeuse in Bothalia **7**, 335 (1960)

Attention is drawn to a character of generic importance in *Sapotaceae*, the shape and size of the seed-scar. This has been described in material from the type area of *Chrysophyllum magalismontanum* Sond. as 'linear-triangular, ventral, occupying about $\frac{3}{4}$ of the length of the seed; 2 mm. wide or more in widest place' (A. Meeuse in Bothalia **7**, 336: 1960). Aubréville describes the scar of the seed of his *Tisserantiodoxa oubanguiensis* as 'occupying the whole ventral face' (Bull. Soc. Bot. France **104**, 277: 1957). Studies of material available at Kew have shown that an increase in width of scar, e.g. *W. D. Holmes* 1170, Mwinilunga, Northern Rhodesia, width 9 mm., is to be found, even on a local basis. Seeds, however, have been very much under-represented in collections, and the De Wildeman species (and others) were described in their absence. It may be possible when fruits are better represented in herbaria to use this character in conjunction with others to define infraspecific taxa.

In addition to the foregoing, two other species, one of which is widely distributed in East tropical and sub-tropical Africa, *C. natalense* Sond., and the other *C. glomeruliferum* Hutch. & Dalz. from Uganda to West Africa, are considered to fall within the concept of the genus *Bequaertiodendron*. New combinations are therefore made as follows:—

Bequaertiodendron natalense (*Sond.*) *Heine & J. H. Hemsley*, comb. nov.

Chrysophyllum natalense Sond. in Linnaea **23**, 72 (1850); Engl. Monogr. Afr. Pfl.-Fam. u. -Gatt. Pl. **8**, 43, t. 34C (1904); Sim, For. Fl. Col. Cape of Good Hope 252, t. 94 (1907). Type: South Africa, Port Natal, *Gueinzius* 181 (S, holo., K, iso.!)

C. kilimandscharicum G. M. Schulze in Notizbl. Bot. Gart. Berlin **12**, 196 (1934). Type: Tanganyika, Mt. Kilimanjaro, *Schlieben* 4528 (B, holo.†, BM, iso.!)

Boivinella natalensis (Sond.) Pierre ex Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **105**, 37 (1958)

B. kilimandscharica (G. M. Schulze) Aubrév. & Pellegr. [errore 'Schütze'], *l.c.* (1958)

Neoboivinella natalensis (Sond.) Aubrév. & Pellegr., *l.c.*, **106**, 23 (1959)

N. kilimandscharica (G. M. Schulze) Aubrév. & Pellegr. [errore 'Schütze'], *l.c.* (1959)

Pouteria natalensis (Sond.) A. Meeuse in Bothalia, **7**, 339 (1960)

Bequaertiodendron oblanceolatum (*S. Moore*) *Heine & J. H. Hemsley*, comb. nov.

[*Chrysophyllum obovatum* auct., non Sabine & G. Don in Trans. Hort. Soc. Lond. **5**, 458 (1824); Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **8**, 35 (1904), *Scott Elliot* 4867!]

Sideroxylon oblanceolatum S. Moore in Journ. Bot. **45**, 47 (1907). Type: Uganda, Toro, Durro Forest, *Bagshawe* 1087 (BM, holo.!)

[*Manilkara* (errore 'Manilhora') *dahomeyensis* auct., non Pierre ex Dubard in Ann. Mus. Col. Marseille, sér. 3, **3** 26 (1915), in syn.; A. Chev., Expl. Bot. Afr. Occ. Fr. 394 (1920), *nomen nudum*]

Chrysophyllum glomeruliferum Hutch. & Dalz., F.W.T.A. **2**, 9 (1931); Aubrév., Fl. For. C. Ivoire **3**, 122, t. 288, fig. 5 (1936); Hutch. & Dalz. in Kew Bull. **1937**, 56 (1937). Types: Sierra Leone, Mt. Gonkui, *Scott Elliot* 4867 (K, syn.!, B, isosyn.); Dahomey, Savalou, *Chevalier* 23789 (K, syn.!, P, isosyn.!)

[*C. natalense* sensu Dale, Indig. Trees Uganda, ed. 2, 392 (1952), non Sond.]

Boivinella glomerulifera (Hutch. & Dalz.) Aubrév. & Pellegr. in Bull. Soc. Bot. Fr. **105**, 37 (1958); Aubrév., Fl. For. C. Ivoire, ed. 2, **3**, 148 (1959)

Neoboivinella glomerulifera (Hutch. & Dalz.) Aubrév. & Pellegr., *l.c.*, **106**, 23 (1959)

Corrigenda corrigantur!—In Fedde's 'Repertorium' **44**, 61 (May 1938), von Poellnitz described a new species of *Adromischus* (*Crassulaceae*) under the name *Adromischus anticordatum*. The type specimen had been collected 30 miles south of Springbok, in Namaqualand, and in a note the author explained the derivation of the specific epithet thus: 'Der Artname leitet sich von *Anticordas* (Springbock) ab'.

A few months later, in the 'Cactus Journal' **7**, 19 (Sept. 1938), an English description of the plant appeared, under the heading: '*Adromischus Antidorcatum* v. P.', followed by a note to the effect that 'the name of this new species is derived from the Latin "antidorcas", which means "springbok".' On the opposite page there appeared a photograph of the type plant (a living specimen in a pot); a label—presumably in von Poellnitz's own hand-

writing—was attached to the pot, reading: 'Adromischus anticordatum v. P. —Typ.' The printed legend to the photograph read, however: 'Adromischus antidorcatum v. P. (The name on the label is incorrectly spelt.)'

In Fedde's 'Repertorium' **47**, 2 (Oct. 1939), the author published a short 'Berichtigung', including a further explanation of the formation of the specific epithet. 'Ich bildete als Artnamen der neuen *Adromischus*-Art den Genitiv pluralis, also "*antidorcatum*". Durch einen unbeabsichtigen Druckfehler ist die Pflanze a. a. O. als *Adromischus anticordatum* veröffentlicht. "*Anticordatum*" ist völlig sinnlos, denn was soll an der Pflanze "*gegen-herz. förmig*" sein? Ausserdem müsste es ja *Adromischus anticordatus* heissen . . . - Die Pflanze heisst also in Zukunft:

'*Adromischus antidorcatum* (*anticordatum* sphalmate) v. P. in Fedde, Rep.', etc.

In spite of all these elaborate explanations and corrections, by an extraordinary stroke of misfortune the name appeared in the Index Kewensis, Suppl. X, 5 (1947), as '*Adromischus antidorcat***us** (sphalm. *anticordat***us**)'!! Whether this was due to a misinterpretation of von Poellnitz's sentence (above), beginning 'Ausserdem . . .', it is now impossible to say.

This, however, is not the last word in this chapter of accidents—or 'Comedy of Errors'. Reference to any Greek or Latin dictionary shows that the stem of the word *dorcas*, meaning a gazelle, from which the generic name *Antidorcas* is derived, is not *dorcat-*, but *dorcad-*. The genitive plural of *Antidorcas* is therefore *Antidorcadum*!

It may be surmised that Dr. von Poellnitz may perhaps have asked a zoological or classical friend for a specific epithet with the desired meaning, and either mis-heard it or noted it down wrongly, being himself not overfamiliar with Latin and Greek. It is clear, in spite of his ridiculing of the form '*anticordatum*', that he was, in fact, himself using it—as witness the handwritten label attached to the living plant in the photograph—and that he originally thought that the name of the springbok was '*Anticordas*'!

In the following attempt to set out the foregoing in an orderly manner, it is perhaps too much to hope that some yet more awful blunder may not have crept in!

Adromischus antidorcadum *von Poelln.* in Fedde, Repert. **44**, 61 (May 1938) (sphalm. *anticordatum*); et in Cact. Journ. [Brit.] **7**, 19 (Sept. 1938) (sphalm. *antidorcatum*, et in icone *anticordatum*); et in Fedde, Repert. **47**, 2 (Oct. 1939) (sphalm. *antidorcatum*); Ind. Kew., Suppl. **10**, 5 (1947) (sphalm. *antidorcatus* et *anticordatus*); corr. *Airy Shaw* hoc loco.

H. K. Airy Shaw

Notes on *Galearia* Zoll. & Mor.

L. L. Forman

In his account of *Galearia* in 'Das Pflanzenreich', Pax left under 'Species incertae affinitatis' two species, namely, *G. celebica* Koorders and *G. maingayi* Hook. f. Pax saw no material of either of these, but merely copied from the original descriptions, which were themselves incomplete owing to the incomplete material upon which they were based. Further collections obtained within recent years have now made it possible to give adequate descriptions of these species. The additional knowledge now obtained concerning *G. celebica* and *G. maingayi* indicates that they are to be regarded as forming a distinct subgenus, which is described in this paper.

Galearia maingayi Hook. f.

G. maingayi was based on two collections made by Maingay in Malacca. No. 2733 (Kew Distribution No. 1412), collected on 2nd October 1867, bears male flowers, which Maingay described in detail in his manuscript 'Flora of Malacca' vol. 4, p. 209 (at Kew) where there is a drawing of the stamens illustrating his remark that the filaments are 'shortly prolonged into a pilose point beyond the anthers'. This character was used by J. D. Hooker in 'The Flora of British India' to separate *G. maingayi* from the other species. The second collection by Maingay, No. 3129 (Kew Distribution No. 1412/2) was made on the 14th April 1868 and consists of 3 (formerly 4) detached leaves, 2 detached fruits and 2 leafless twigs—there is no infructescence. The fruits are quite exceptional for *Galearia*. Maingay's notes describing them are attached to the sheet and contain the following remarks: 'Fruit (immature) fleshy, capsular, rugose, globose, pale green with 3 longitudinal alae extending from the apex to the base, 2–3-locular.' This was quoted by Hooker in his original description of the species, which he considered: 'Possibly generically distinct from *Galearia*'.

Pax, who did not see any material of *G. maingayi* for his revision, quoted Hooker's description without mentioning the important character of the prolonged, hairy connective.

Recently, specimens have been collected in Malaya, Sumatra and Borneo with male flowers agreeing extremely well with those of *Maingay* 2733, but with fruits totally different from those of *Maingay* 3129. It appears, however, that if the fruits of *Maingay* 3129 could be excluded, all the new material would be conspecific with the type material of *G. maingayi*. Since there is no evidence that the fruits of *Maingay* 3129 really belong to the leaves (the absence of an infructescence is significant in this connection) it is assumed here that the fruits belong to an entirely different plant and that all the new material mentioned above is to be referred to *G. maingayi*.

It is interesting that the real fruits of *G. maingayi* are also remarkable for *Galearia* since they are subspherical and smooth, with an exceedingly hard and thick wall, and contain 4 or 5 cells. This contrasts sharply with the typical fruit of *Galearia* which is laterally compressed, much more thinly walled, with a rather knobbly surface, and 2-celled.

It is now apparent that *G. maingayi*, hitherto only known from the type-material collected in Malacca, has an area of distribution extending over East Malaysia, and in some regions, e.g. E. Borneo, it is quite a common species. A new description based on all the specimens cited below now follows.

Galearia maingayi *Hook. f.* in Hook.f., Fl. Brit. India **5**, 377 (1887); Pax in Engler, Pflanzenreich IV. **147**, III, 103 (1911); Ridley, Fl. Malay Peninsula **3**, 255 (1924)

Tree up to 35 m. high with a bole up to 20 m. high, up to 2 m. in diameter. *Branchlets* mostly whitish, especially on underside, densely covered when young with minute, appressed, pale brown hairs, later glabrescent. *Stipules* triangular, 0·5 mm. long, puberulous, often early caducous. *Leaves*: Petioles 5–8 mm. long, blackish, puberulous, glabrescent. Lamina lanceolate to elliptic, 8·5–18·5 cm. long, 2·75–8·5 cm. broad, base often unequal, broadly cuneate to acute, apex acuminate, puberulous on lower surface and along midrib when young, soon glabrescent, upper surface glabrous, about 6–9 pairs of main lateral nerves prominent on both surfaces, thinly coriaceous. *Male inflorescences*: terminal racemes, 13–21 cm. long, covered with minute, appressed, pale brown hairs, flowers arising several together in small groups. *Male flowers* greenish-white: Pedicels 4–6 mm. long, puberulous. Buds becoming oblong in outline. Calyx cup-shaped, shallow, 1 mm. long with 5 very short teeth, puberulous. Petals oblong with tips inflexed in bud, becoming 2·5 mm. long at anthesis, scarcely concave, tomentellous on both surfaces, strongly keeled within. Stamens 10 in two whorls, the outer whorl of 5, 2 mm. long, opposite the sepals, the inner whorl of 5, 1·25 mm. long, opposite the petals; filaments densely hairy, connective densely hairy and produced beyond the anthers; anthers glabrous. Pistillode shorter than the stamens, ellipsoidal, tomentellous. *Female inflorescences* as in male plants, 3·0–8·0 cm. long; flowers arising singly. *Female flowers* with pedicels, calyx and corolla as in male flowers, except pedicels thicker and c. 1 mm. shorter; petals c. 0·5 mm. longer and less strongly keeled within. Ovary 5-lobed, tomentellous, 1·5 mm. long; style arms 10, irregularly lobed, consisting of bunches of fine processes. *Infructescences*: terminal racemes, 2·5–10 cm. long, 2–3·5 mm. thick, covered with minute, appressed, pale brown hairs. *Fruits* on thick pedicels 3–5 mm. long, subspherical, sometimes rather flattened at apex, obscurely 3–5-angled, 20–25 mm. in diameter, rather smooth, glabrous; walls very hard about 8 mm. thick, bony endocarp mostly 2–3 mm. thick, broken up towards periphery with softer strands passing through it; cells 3–5.

Habitat. Recorded from primary forest at altitudes between 20 and 180 m. Growing on sandy loam in E. Borneo, where it is locally common. Vernacular name. Sumatra: *medang keli*.

Collections examined (all in Herb. Kew., unless otherwise stated):—

Sumatra. Palembang District—Muara Enim; April (♂), *Buwalda* 7627. *Sine loc.*; (fruit), *Forbes* 2838 (in BM). Lematang Ilir, Semangus; June (fruit), *Neth. Ind. For. Service* bb. 31986. *Ibidem*; April (♂), *Neth. Ind. For. Service* bb. 31690. Lematang Ilir, Mt. Megang; September (fruit), *Soekaria bb.* 35172.

Malaya. Malacca; October (♂), *Maingay* 2733 (Kew No. 1412 (syntype)). *Ibidem*; April (sterile—i.e. excluding fruits), *Maingay* 3129 (Kew No. 1412/2 (syntype)). Perak, Kledang Saiong Forest Reserve; April (fruit), KEP (*Mohd. Yassin*) 39161 (K, KEP). Perak, Parit, Kinta; April (fruit), KEP (*Symington*) 39472 (KEP). Pahang, Bentong; July (fruit), KEP 78655 (KEP). Negri Sembilan, Port Dickson, Sg. Mengala F.R.; Oct. (♀ fl.), KEP (*Motan*) 66586 (KEP).

Borneo. W. Borneo—Melawi Tjatit, Gontuk; March (fruit), *Neth. Ind. For. Service bb.* 27009. E. Borneo, Kutei Region—Belajan River, ńear Long Bleh; March (fruit), *Kostermans* 10242. Gunung Kelopok, near Tabang; April (♂), *Kostermans* 10490. Near Tabang; August (fruit), *Kostermans* 12694. Loa Lampong; March (fruit), *Nedi* 751. Brunei, Ulu Poti, Belait; July (sterile), *Ashton* BRUN 386.

Galearia celebica Koorders

The original description of *G. celebica* by Koorders was based on female flowering and fruiting material; it is a rather brief and superficial description, omitting several characters in the flowers and fruits which are most unusual or unique for *Galearia*.

Recently, a male specimen from New Guinea (*Womersley* 3841) was recognized by Dr. Bakhuizen van den Brink Jr. at Leiden as belonging to *G. celebica*. As a result, several other collections from New Guinea belonging to this species have been found at Kew; some of these represent a new variety which is described below.

From this additional material it is seen that the inflorescences are cauliflorous as well as terminal. Hitherto, only terminal inflorescences have been known in *Galearia*. The stamens of *G. celebica* prove to be exceptional within the genus since they are all equal, arranged in a single whorl and have very thick, broad filaments. The petals are exceptionally large and fleshy. The depressed 2- to 4-celled fruits are also remarkable within the genus. Through the kindness of the Director, Rijksherbarium, Leiden, I have been able to examine the type material of *G. celebica*. The description which follows is based on all the collections cited below under the two varieties.

Galearia celebica *Koorders* in Meded. 's-Lands Plantentuin, Buitenzorg **19**, 584, 626 (1898); Pax in Engler, Pflanzenreich IV. **147**, III, 103 (1911)

Tree up to 10 m. high. *Stipules* narrowly conical, 1 mm. long, caducous. *Leaves*: Petioles 6–10 mm. long. Lamina ± oblong-elliptic, margin often crenulate or subcrenulate in distal half, 13–27 cm. long, 5–10 cm. broad, base very unequal to equal, narrow to broadly rounded, apex acuminate or obtuse, about 7 or 8 pairs of main lateral nerves prominent on both surfaces, chartaceous or subcoriaceous. *Male inflorescences*: racemes terminal and solitary or cauliflorous and fascicled, up to about 60 cm. long, puberulous, flowers arising in groups of 2 or 3. *Male flowers* white or cream: Pedicels 8–11 mm. long, puberulous. Calyx cup-shaped, shallow, 1·5 mm. long, obscurely 5-lobed. Petals yellow, lanceolate-oblong, very thick, fleshy, reflexed at anthesis, 4 mm. long, tomentellous on both surfaces without a median ridge within. Stamens 10–15, equal in a single whorl, 1·5 mm. long; filaments oblong acute, 0·75 mm. broad, very thick, laterally contiguous, tomentellous, the inner surface connate towards the base with the pistillode; anthers narrow. Pistillode ovoid, acute, exceeding the stamens by 1 mm., tomentellous. *Female inflorescences* as in male plants, 15–30 cm. or more long, puberulous, flowers arising singly. *Female flowers* white: Pedicels, calyx and petals as in male flowers. Ovary subglobose, tomentellous 1·5 mm. long,

style-arms 5 (? always), elongate, reflexed, glabrous. *Fruits* yellow or whitish with pedicels 6–9 mm. long, depressed-globose, 12–16 mm. high, 16–25 mm. in diameter, transversely elongate when 2-celled, 3- or 4-cornered when 3- or 4-celled, surface puberulous, sometimes uneven with shallow grooves running from the apex to the corners, or with a rather even surface (in *Aet* 433), walls mostly 4–5 mm. thick, bony endocarp less than 1 mm. thick.

Habitat. In forests at altitudes of up to 500 m.

Distribution. NE. Celebes, New Guinea, New Britain.

Key to varieties

Leaves glabrous (young leaves puberulous along midrib on lower surface) var. *celebica*

Leaves softly hairy on lower surface . . . . . var. *pubescens*

Table 1. Characters of *G. maingayi* and *G. celebica* compared with those of typical *Galearia*.

	Characters of *Galearia* (typical)	Anomalous characters of *G. maingayi*	Anomalous characters of *G. celebica*
Leaf-margin	entire	—	crenulate in distal half
Inflorescences	terminal	—	terminal and cauliflorous
Calyx	5-toothed or 5-fid	subtruncate with 5 minute teeth	
Petals	cochleate, concave or cucullate	straight, scarcely concave, or reflexed	
	glabrous, or puberulous at margins and towards apex	tomentellous over entire surface	
	thin	fleshy	
Stamens	10	—	10–15
	in 2 series	—	in 1 series
Ovary	2-locular	5-locular (? always)	
Fruit	transversely oblong	globose	depressed
	1(–2)-locular	3–5-locular	2–4-locular
Exocarp	thin, fleshy	woody	woody

var. **celebica**

Branchlets, stipules petioles and lower surface of leaf along midrib puberulous when young, soon glabrescent.

Lectotypus: *Koorders* 16975, Celebes, Minahassa (in Herb. Leiden).

Collections examined:—

Celebes. Minahassa—April (♀ flowers, fruit), *Koorders* 16975 (L). April (♀ flowers), *Koorders* 19593 (L). April (sterile), *Koorders* 19636 (L). Amurang: August (sterile), *Neth. Ind. For. Service bb.* 18680 (L).

New Guinea. W. New Guinea—Aëndoea River, near Oeta; July (fruit), *Aet* 433 (K). Rouffaer River; September (♂), *Docters van Leeuwen* 10457 (K). Territory of New Guinea—August River, Sepik District; September (♂), *Womersley* NGF 3841 (K, L). Papua—Veiya; March (♂), *Carr* 11649 (K). Kokoda; (May (♂), 16505 (K).

var. **pubescens** *Forman*, var. nov.

Ramuli, stipulae, petioli et lamina subtus pilis mollibus flavidis obtecti; lamina supra secus costam et nervos primarios interdum puberula ceterum glabra.

Holotypus: *Floyd* NGF 7018, New Britain (in Herb. Kew).

Vernacular name. West New Guinea: *barbururugo*.

Collections examined:—

New Guinea. West New Guinea—Sorong, Tandjung Kaswari; August (♀ flowers), *Djamhari* 504 (K). Mamberano River, Albatross Camp; May (fruit), *Docters van Leeuwen* 9120 (K). Sorong, near Baru; July (♀ flowers), *Main* 382 (K) and *ibidem*, *Pleyte* 394 (K). East of Sorong; March (fruit), *van Royen* 3179 (K). Territory of New Guinea—August River; (♂), *Hollrung* 806 (K).

New Britain. Keravat, Gazelle Peninsula; May (fruit) *Womersley* NGF 3425 (K). *Ibidem*; March (♂), *Womersley* NGF 7937 (K). *Ibidem*; January (♂), *Floyd* NGF 7018 (K).

General remarks

The accompanying table summarises the characters of *G. maingayi* and *G. celebica* which have not hitherto been known to occur in the genus. These two species do not appear to be closely related to any others, on account of the anomalous characters of the calyx, petals and ovary which are common to both of them, and which therefore indicate an affinity between them. The table also shows some important characters which occur in *G. celebica*, but are not found in other species.

G. celebica and *G. maingayi* are sufficiently distinct from other species to form the basis of a new subgenus, which is described below.

The original description of *Galearia* by Zollinger & Moritzi in Moritzi, Syst. Verzeich. Zollinger 19 (1846), is accompanied by descriptions of two species based on collections made by Zollinger in Java, viz., *G. sessilis* Zoll. & Mor. and *G. pedicellata* Zoll. & Mor. These are both referred by Pax in Engler, Pflanzenreich IV. **147**, III, 98 (1911) to *G. filiformis*, the only species now accepted for Java. *G. sessilis* was described as having sessile flowers, which indicates that the type (*Zollinger* 567—not seen by me) must bear young inflorescences; in *G. filiformis*, the young buds are almost sessile. The pedicellate flowers described for *G. pedicellata* are characteristic of fully developed inflorescences of *G. filiformis*. I therefore select *G. pedicellata* Zoll. & Mor. as the lectotype of *Galearia* Zoll. & Mor.

The generic name *Galearia* Zoll. & Mor. (1846) requires to be conserved against *Galearia* Presl (1830), which was originally applied to several species of *Trifolium* L. and is now used as a sectional name within that genus. A formal proposal for the conservation of *Galearia* Zoll. & Mor. will be published in 'Taxon'.

Pax established two sections within the genus, namely, *Galearia* (originally '*Eugalearia*') and *Longibracteata*. These now become sections of the subgenus *Galearia*.

The divisions of the genus are as follows:—

Galearia *Zollinger & Moritzi* in Moritzi, Syst. Verzeich. Zoll. 19 (1846), *nom. conserv. prop.*, non *Galearia* Presl, Symb. Bot. **1**, 49 (1830)

Lectotypus: *G. pedicellata* Zoll. & Mor.

Subgenus **Galearia**

Folia integra. *Calyx* 5-dentatus vel 5-fidus. *Petala* cochleata, concava vel cucullata, glabra vel margine et apicem versus puberula. *Stamina* 10, biseriata. *Ovarium* 2-loculare. *Fructus* transverse oblongus; exocarpium carnosum.

This subgenus contains two sections, *Galearia* and *Longibracteata* Pax, which together include all species of the genus other than *G. celebica* and *G. maingayi*.

Subgenus **Orthopetalum** *Forman*, subgen. nov.

Folia integra vel apicem versus crenulata. *Calyx* subtruncatus, minute 5-dentatus. *Petala* plana, vix concava, interdum reflexa, utraque pagina tomentella, carnosa. *Stamina* 10–15, uniseriata vel biseriata. *Ovarium* 2–5-loculare. *Fructus* subglobosus vel depressus; exocarpium lignosum.

Typus: *G. celebica* Koorders

Subgenus *Orthopetalum* contains *G. celebica* Koord. and *G. maingayi* Hook. f.

The name *G. pedicellata* Zoll. & Mor., referring to a Javanese species having glabrous stamens, was published in 1846. Later, R. Brown, apparently unaware of the publication of the name *Galearia* Zoll. & Mor., published the synonym *Bennettia* R.Br. in Bennett and Brown, 'Plantae Javanicae Rariores' p. 251 (1852). In this work, appeared the name *Bennettia pedicellata* R. Brown, based on *Wallich* 8585C from Penang, a plant having hairy stamens. Miquel, in his 'Flora Indiae Batavae' vol. 1, part 2 (1859), recognised the synonymy of *Bennettia* R.Br. with *Galearia* Zoll. & Mor., but he misidentified *Bennettia pedicellata* R.Br. with *Galearia pedicellata* Zoll. & Mor. As a result, the homonym *G. pedicellata* (R.Br.) Miq. has been applied up till now to the Penang species, which requires a new name.

Galearia caudata *Forman*, nom. nov.

Bennettia pedicellata R. Brown in Benn. & R. Brown, Pl. Jav. Rar. 251 (1852) [*Galearia pedicellata* (non Zoll. & Mor.)—(R.Br.) Miq., Fl. Ind. Bat. **1**(2), 430 (1859); Hook.f. in Fl. Brit. Ind. **5**, 378 (1887); Pax in Engler, Pflanzenreich IV. **147**, III, 101 (1911); Ridley, Fl. Malay Penin. **3**, 257 (1924)]

A noteworthy features of the leaves of *Galearia* is that they are arranged distichously on rather short branches, each of which bears a supernumerary

bud in its 'axil'. When they do not terminate in an inflorescence, these ultimate leafy branches superficially resemble pinnate leaves: compare the pinnate leaves of *Chisocheton* which terminate in a bud.

A distinctive character of *G. maingayi* and *G. celebica*, which I have not observed in other species, is the pincer-shaped bud terminating those branches which do not bear inflorescences. Since the leaves are distichous, the young leaves in the bud are arranged above one another in a single plane with the subulate stipules between them. The lowest pair of leaves in the bud are curved upwards and inwards like two pincer-claws. It is possible that this type of bud may occur in other species; in all the material which I have seen, only branches terminating in inflorescences are represented. The attention of collectors is directed to this character.

A new species of Oldenlandia.—Oldenlandia rhabdina *Brem.*, sp. nov. in subgenere *Oldenlandia* includenda, floribus ad nodos solitariis longipedicellatis et foliis linearibus *O. herbaceae* (L.) Roxb. similior, sed caule subtereti, testa e cellulis multo minoribus non granulatis composita, ab ea recedens.

Herba erecta, circ. 35 cm. alta, valde ramosa. *Caulis* subteres, papillosus, medio 1·3 mm. diam., internodiis in medio caule 2–3 cm. longis vix notabiliter bisulcatis, ex axillis foliorum omnium, inferioribus solum exceptis, ramificatus. *Folia* anguste linearia, in medio caule circ. 5 cm. longa et 1·2 mm. lata, superiora gradatim breviora et angustiora et sensim in bracteas filiformes transeuntia, utraque facie glabra, margine revoluta, costa supra impressa subtus prominente. *Vagina stipularis* truncata, utroque latere caulis in setas 2 producta. *Flores* primum terminales, sed mox in positionem pseudoaxillarem coacti, longe et graciliter pedicellati et subpaniculatim dispositi, probabiliter heterostyli. *Pedicelli* 1·5–3·0 cm. longi, inferiores foliis parvis filiformibus, superiores bracteis longitudine gradatim usque ad 1 mm. decrescentibus suffulti. *Ovarium* glabrum. *Calycis lobi* 0·7–1·0 mm. longi, glabri. *Corolla* extra glabra, tubo anguste infundibuliformi 3·5 mm. longo, lobis 2·0 mm. longis, ad faucem vix notabiliter barbata. *Stamina* in flore dolichostylo adhuc solum noto in fauce inclusa; antherae sessiles, 0·9 mm. longae; granula pollinis 4-colporata, 15μ longa et 9μ diam. *Stylus* in flore dolichostylo cum stigmatum apicibus exsertis, glaber; stigmata filiformia, 1·6 mm. longa. *Capsula* in dimidio superiore calyce cincta, subglobosa, circ. 4 mm. diam., rostro non supra calycis lobos producto, glabra. *Semina* madefacta glutinosa; cellulae testae parvae, parietibus rectis instructae, laeves.

Habitat Nigeriam septentrionalem.

Northern Nigeria: Bauchi Province, Lane District, Bangwele near Kulfana, on cultivated ground amongst guinea-corn, 960 m., 28 Sept. 1954, *G. V. Summerhayes* 44 (K, holotype).

The pollen-grains are remarkably small for an *Oldenlandia* species. As the only ones seen by me were immature and considerably shrunk, it is not impossible that well-developed grains will prove to be somewhat larger, but it nevertheless does not look probable that they will reach the dimensions

recorded for the pollen-grains of the other species. It is noteworthy that the cells of the testa too are rather small, viz. 25–30 × 15–20μ, but testa-cells of this size occur also in other species, e.g. in *O. microcarpa* Brem., *O. linearis* DC. and *O. fastigiata* Brem.

O. rhabdina occupies a rather isolated position in the subgenus *Oldenlandia*. By the disposition of the long-pedicellate flowers it resembles *O. herbacea* (L.) Roxb. and *O. pumila* (L.f.) DC., and by the narrowly linear leaves the resemblance to the first-named species becomes very striking indeed, but it differs from both species in the subterete stem, in the 4-colporate pollen-grains, and in the small, non-granulate testa-cells. In the 4-colporate pollen-grains it differs also from all other species of the subgenus *Oldenlandia*. Like *O. herbacea*, it shows in habit, especially in the form of the leaves and in the disposition of the long-pedicellate flowers, a rather striking resemblance to *O. microcalyx* K. Schum., which belongs to the subgenus *Trichopodium* Brem. In this subgenus the pollen-grains are 4- or 5-colporate and the stems are subterete, but the seeds of the species belonging to this subgenus do not become slimy when moistened, and the testa-cells are much larger than those of *O. rhabdina*.

C. E. B. Bremekamp

Passiflora retipetala Masters and P. lonchophora Harms.—When the latter species was figured and described by me from Trinidad material in Hook., Ic. Pl. tt. 3553–4 (1956), I indicated the close affinity with *P. retipetala* Masters, a species of Guiana and Amazonian Brazil with entire leaves, suggesting that ample collections might well show that the two taxa were inseparable although they had been placed by Killip in different series (*Lobatae* and *Simplicifoliae*) of the subgenus *Granadilla*. I recalled how simple and 3-lobed leaves could occur on the same individual of the same species of climbing plants in certain families such as *Cucurbitaceae*.

Recent evidence from the Northern Range of Trinidad has completely confirmed this suggestion. Material of *P. lonchophora* collected at 2000 ft. at 10 miles up the Blanchisseuse Road (near where W. E. Broadway and Prof. Herklots gathered it) by Dr. Henry Fleming, entomologist with the New York Zoological Society's tropical station in Trinidad, and deposited in the Herbarium of the New York Botanical Garden, shows two branchlets from the same plant, one with leaves all entire, the other with leaves all 3-lobed as on previous Trinidad and Tobago specimens of *P. lonchophora*. The branchlet with entire leaves cannot, in my opinion, be distinguished from the type specimen of *P. retipetala* Masters. Moreover, one sepal on a flower of the other branchlet shows a long, free, apical portion of the winged keel approaching that of sepals of Guiana *lonchophora* and indicates variability in the development of this organ. I should now no longer hesitate to identify both Guiana and Trinidad and Tobago material of *P. lonchophora* with *P. retipetala*. Dr. Fleming's specimens, which were kindly sent on loan to me at the suggestion of Dr. J. J. Wurdack, were collected (without number) in 1959.

N. Y. Sandwith

Lt. V. L. Cameron's collecting localities in Central Africa: A Correction.—Among the first species to be described from Central Africa are the 12 new species (one of which, *Barleria limnogeton* S. Moore, is still known from the type only) described in an enumeration by Oliver (1876) of the plants 'collected by Lieut. Cameron south of Kawele (lat. 4° 58′ 3″S., long. 30° 4′ 30″E.) in his journey round the shores of Lake Tanganyika'. In an earlier paper (Gillett, 1958) this statement was unfortunately taken at what seemed to be its face value and the type specimens of three species of *Indigofera* were accordingly said to have come from approximately 4° 58′S., 30° 4′E.

A more thorough investigation shows this view to be doubly wrong. Firstly the longitude of the spot where Kawele stood is c. 29° 43′E., and not 30° 4′ 30″E., as stated by Oliver. Secondly Cameron's plants, although they may have been collected near Kawele, where Cameron spent, in all, some 5 weeks between 18th February and 22nd May 1874, *may also* have been collected at any of the places in what is now Tanganyika Territory, Northern Rhodesia and the Belgian Congo which were visited by Cameron during a journey by boat round the southern part of Lake Tanganyika which lasted from 13th March to 9th May 1874. Some of these places are as much as 400 km. from Kawele.

The first of these corrections is established by comparing the location of Kawele on maps published by Cameron in 1875 and 1877 with modern maps. The second is proved by the fact that, when Cameron (1877) reprinted Oliver's paper as an appendix to his book 'Across Africa', he corrected Oliver's foreword, leaving out the misleading reference to Kawele, and instead stating that the plants were 'collected by me in the southern basin of Lake Tanganyika' leaving the reader to see from the map and narrative what was meant by this term. As Kawele was the northernmost place on the lake visited by Cameron the plants were collected south of it only in the sense that Truro may be said to lie in England south of York. From Cameron's map of 1875 which shows most of his camp sites near the lake and his narrative of 1877 it may be learned that he spent 72 days on the Tanganyika Territory coast (including the 5 weeks at Kawele), three on the Northern Rhodesian coast and 17 on the Belgian Congo coast of Lake Tanganyika. There may thus be said to be a probability that most of his plants were collected in what is now Tanganyika Territory but further than this it does not seem possible to go.

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J. B. Gillett

Nomenclatural note on Labisia Lindl. (Myrsinaceae).—In an interesting note, van Steenis (Fl. Mal. Bull. **1**, No. 4, 109: 1948) has shown that Reinwardt's neglected genus *Angiopetalum* (1825) is none other than Lindley's well-known *Labisia* (1845). He has proposed, however, that the latter name be conserved, and this has been done. The identification of *Angiopetalum*, however, entails some changes in *Labisia* at the specific and infra-specific levels, for van Steenis has also shown (*l.c.* 97–99) that Reinwardt's paper (in Syll. Pl. Nov. Ratisb. **2**, 1–15), in which *Angiopetalum punctatum* appeared, was almost certainly published late in 1825; whereas Part 13 of Blume's Bijdrage, containing the description of *Ardisia pumila* Bl. (= *Labisia pumila* (Bl.) F.-Vill.), probably did not appear until February 1826. Blume's epithet must evidently, therefore, be superseded by Reinwardt's.

Mez, in his monograph of the *Myrsinaceae* (Engl., Pflanzenr. IV. **236**, 171–2: 1902), retains the three forms originally recognised by Scheffer (Comm. Myrsin. Archip. Ind. 93: 1867) for this polymorphic species: α *genuina* Mez, β *lanceolata* (Scheff.) Mez, and γ *alata* (Scheff.) Mez. Now Scheffer cited '*Allopetalum punctatum* Reinw. MS.' (= *Angiopetalum punctatum* Reinw.; see van Steenis, *l.c.*) under his var. *alata*, and Mez cited specimens of Reinwardt under f. *alata* also. With Reinwardt's specific name superseding Blume's, this means that the 'type' form of the species is no longer f. *genuina*, but f. *alata*. The consequent changes will become clear from the following synonymy.

Labisia punctata (*Reinw.*) *Airy Shaw*, comb. nov.
Angiopetalum punctatum Reinw. in Syll. Pl. Nov. Ratisb. **2**, 7 (1825)
Ardisia pumila Bl. Bijdr. (13), 688 (1826)
Labisia pothoina Lindl. in Bot. Reg. **1845** [n. ser. **18**], t. 48 (1845)

forma **punctata**
Angiopetalum punctatum Reinw., *l.c.*
Allopetalum punctatum Reinw. ex Scheff. Comm. Myrsin. Archip. Ind. 92 (1867), *pro syn.*
Ardisia pumila γ *alata* Scheff., *l.c.*
Labisia alata (Scheff.) N. E. Br. in Illustr. Hortic. **32**, 186, t. 580 (1886)
Labisia pumila γ *alata* (Scheff.) Mez in Engl., Pflanzenr. IV. **236** (*Myrsinac.*), 172 (1902)

forma **lanceolata** (*Scheff.*) *Airy Shaw*, comb. nov.
Ardisia pumila β *lanceolata* Scheff., *l.c.*
Labisia pumila β *lanceolata* (Scheff.) Mez, *l.c.*; Airy Shaw in Bull. Misc. Inf., Kew **1939**, 516 (1939)

forma **gladiata** (*Airy Shaw*) *Airy Shaw*, comb. nov.
Labisia pumila f. *gladiata* Airy Shaw, *l.c.* 517

forma **pumila** (*Bl.*) *Airy Shaw*, comb. nov.
Ardisia pumila Bl., *l.c.*
Labisia pumila (Bl. F.-Vill. in Naves & F.-Vill., Noviss. App. Fl. Philipp. Blanco, 123 (1880); Mez, *l.c.*
Labisia pumila α *genuina* Mez, *l.c.*

H. K. Airy Shaw